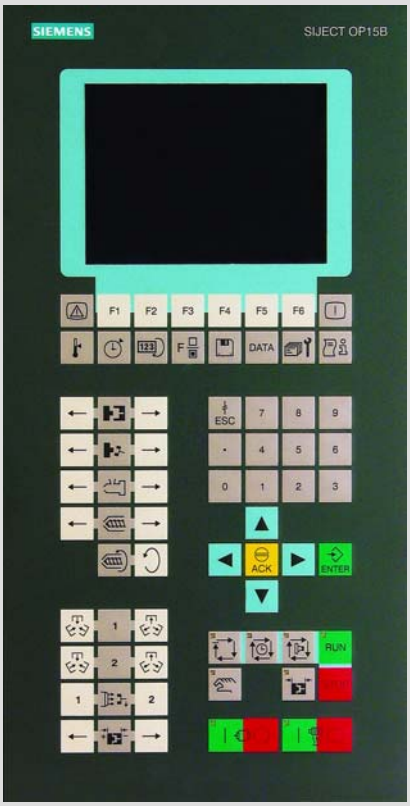
SIEMENS

SIJECT 15/16
Start-Up

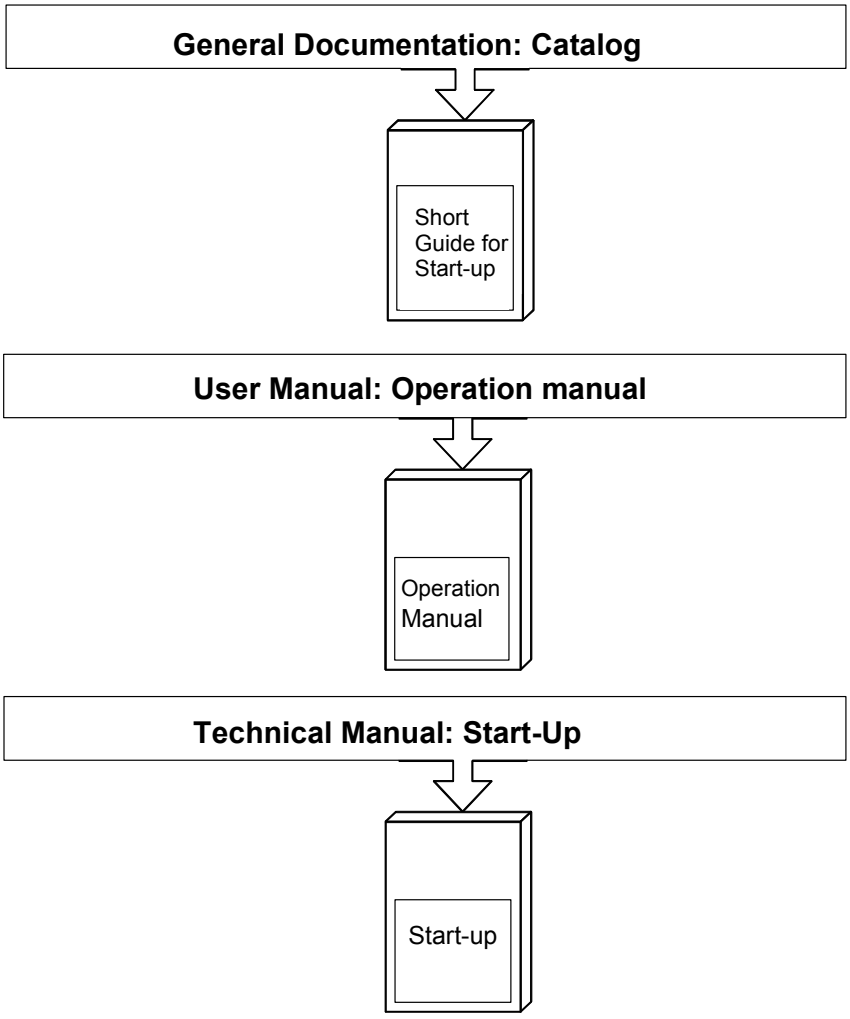
Software Version 1

Technical Manual 06.2003 Edition



Manufacturer Documentation

SIJECT 15/16 Document Structure



SIEMENS

SIJECT 15/16
Start-Up

Software Version 1

Technical Manual

SIJECT15/16 Control System 1

Installation of Control System 2

Start-up 3

Programming Tool 4

Technical Appendix 5

Valid for

Control System	*Software Version*
SIJECT 15/16	1.08

06.2003 Edition

SIJECT® Documentation

Key to editions

The editions listed below have been published prior to the current edition.

The column headed "Note" lists the amended sections, with reference to the previous edition.

Marking of edition in the "Note" column:

A .... New documentation.
B .... Unchanged reprint with new order number
C .... Revised edition of new issue.
If any technical details presented on one of these pages have been changed with reference to the previous edition, it is indicated by another edition number in the header of the respective page.

Edition	Order No.	Remark
12.2000	6AT1931-5AB61-0KA0	A
06.2001	6AT1931-5AB61-0KA0	C
07.2002	6AT1931-5AB61-0KA1	A
06.2003		

Tested Siemens quality for software and training to
DIN ISO 9001, Reg. No. 2160-01

This publication was made with WinWord V 7
and Designer V 6.0
Passing on and reproduction of this document, and utilization and disclosure of its contents is not allowed unless specifically authorized.
Violations shall be cause for damage liability. All rights reserved, particularly in the event a patent is issued or a utility model patent is registered.

© Siemens AG 2003. All Rights Reserved.

Other functions which are not described in this Documentation can possibly also be performed on the control system. However, the customer is not entitled to demand these functions when new equipment is supplied or servicing is carried out.

Although we have checked the contents of this publication for agreement with the hardware and software described, we do not accept liability for total agreement since differences cannot be totally ruled out. The information in this publication is checked at regular intervals and necessary correction included in the next release. Suggestions are welcome.

Subject to change without prior notice.

Order No.
Printed in People's Republic of China

Siemens-Aktiengesellschaft.

Safety Notice

This Manual contains notices intended to ensure your personal safety and to avoid material damage. The notices are highlighted by a warning triangle and, depending on the degree of hazard, represented as shown below:

Danger

indicates that loss of life, severe personal injury or substantial material damage **will** result if the appropriate precautions are not taken.

Warning

indicates that loss of life, severe personal injury or substantial material damage **may** result if the appropriate precautions are not taken.

Caution

indicates that minor personal injury or material damage may result if the appropriate precautions are not taken.

Note

Is used to draw your special attention to an important information on the product, the handling of the product or the corresponding part of the documentation.

Qualified Personnel

Start-up and operation of a device may only be carried out by qualified personnel. Qualified personnel as referred to in the safety notices provided in this Manual are persons who are authorized to start up, ground and tag devices, systems and circuits according to the relevant safety standards.

Usage as per intended purpose

Please observe the following:

Warning

The device may only be used for the cases of application, as intended by the Catalog, and only in conjunction with third-party devices and components recommended or approved by Siemens

The proper and safe operation of the product requires transport, storage and installation, according to the relevant instructions and qualified operation and maintenance at the prescribed intervals

Table of Contents

1 SIJECT 15/16 Control System 1-1
1.1 Components of SIJECT 15/16 1-2
1.2 Technical Data 1-4
1.3 Order Number 1-7

2 Installing the Control System 2-1
2.1 Installing and Dismantling 2-2
2.2 Interfaces and cabling 2-6
2.3 Connecting the Individual Components of CI 2-11
2.3.1 Connecting the Operator Panel (X11) 2-12
2.3.2 Pin assignments of the RS232/MPI Interface (X12) 2-13
2.3.3 Pin assignments of the P_bus Interface (X14) 2-14
2.3.4 Pin assignments of the Profi_bus Interface (X15) 2-15
2.3.5 Connecting the Digital inputs (X203, X204, X205, X206) 2-16
2.3.6 Connecting the Thermocouples (X200, X201) 2-19
2.3.7 Connecting the linear scale (X202) 2-21
2.3.8 Connecting the Digital outputs (X300, X301, X302) 2-23
2.3.9 Connecting the relay outputs (X303, X304) 2-26
2.3.10 Connecting the analog outputs (X305, X306, X307) 2-28
2.4 Power supply 2-30
2.5 Grounding 2-32
2.6 LEDs and Mode selector S1 2-34

3 Start-up 3-1
3.1 General 3-2
3.1.1 Access levels 3-3
3.1.2 Structure of recipe data 3-4
3.1.3 Handling of recipe data 3-5
3.1.4 Recipe Data Saving 3-6
3.2 Switching on and Booting the control system 3-7
3.2.1 Boot messages 3-8
3.2.2 Alarm 3-11
3.3 Checking I/Os 3-13
3.4 Setting important parameters 3-15
3.4.1 Language selection 3-16
3.4.2 Service selection 3-17
3.4.3 Setting linear scale 3-19
3.4.4 Setting Password 3-21
3.4.5 Save/load setting 3-23
3.4.6 Proportional valve adjustment 3-24
3.4.7 Pump Combination Setting 3-26

3.4.8 Lubrication setting 3-27
3.4.9 Temperature setting 3-28
3.4.10 Setting the Ramp data 3-30
3.5 Up-/download PLC program 3-32

4 Programming Tool 4-1
4.1 SIJECT Project Tool 4-2
4.1.1 Introduction 4-2
4.1.2 Data types 4-4
4.1.3 Operators 4-6
4.1.4 Standard Library Elements 4-14
4.1.5 Operands 4-17
4.2 SIMATIC Manager 4-19

5 Technical appendix 5-1
5.1 Definition of DB1 5-2
5.2 Glossary abbreviation 5-8

1 SIJECT 15/16 Control System

Contents

Section	Heading	Page
1.1	Components of SIJECT15/16	1-2
1.2	Technical Parameter	1-4
1.3	Order Number	1-6

1.1 Components of SIJECT 15/16

What is SIJECT15/16?

The SIJECT 15/16 is a controller for injection molding machine. It offers solutions for injection molding machines from low-end applications to high-end applications.

Hardware components

It consists of the following hardware components:

- **CI**: Compact interface, main controller, i.e., CPU and I/O board.
- **OP**: Operator panel, with LCD display and keyboard, i.e. CPU, LCD, and Keyboard
- **Cable**: Communication cable between CI and OP.

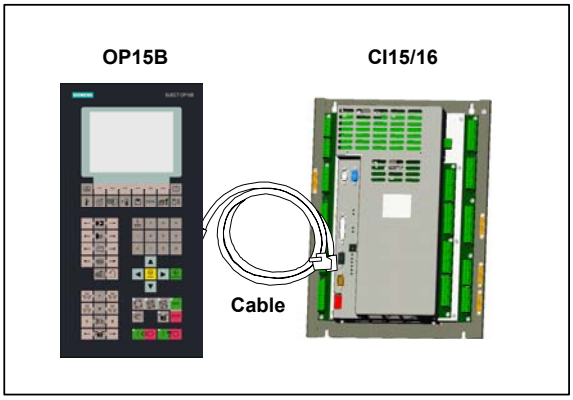


Fig 1-1 Hardware components of SIJECT 15/16

Software components

SIJECT15/16 comprises the following software components, in which the parts marked with a star symbol (*) can be ordered separately:

- System software on the permanent Flash-EPROM of the CI:
  - System frame: is the basic programming environment for all program modules.
  - Loading kernel (SIJECT Sijload*): loads all the remaining part of the software of micro-controller
  - Firmware: includes I/O message, Memory card object, communication with OP
  - PLC application program: executes the Integrated PLC User Program cyclically. It is usually stored in MMC and delivered to customer.

- System software on the Flash-EPROM of the OP:
  – System frame: is the basic programming environment for all program modules.
  – Loading kernel (SIJECT Sijload*): loads all the remaining part of the software of micro-controller.
  – Firmware: includes display code, key scanning, and communication with CI.
  – Application software: includes menus, customer specific picture, and recipe data.

- Toolbox (programming tool)
  - SIJECT project tool (SIJECT PTPS*): it is the programming tool only applicable to SIJECT 15.
  - SIMATIC S7-300*: it is the programming tool only applicable to SIJECT 16.

- Multimedia card (MMC card*)

  It contains the PLC application programs (max.2 MB), maximum 50 sets recipe data (50KB), OP-menus (max.64KB) and a customer specific picture (max.8KB).

User data

User data are:

- Customer specific picture
- Recipe data
- PLC program

Data saving

Modified user data are saved in the Flash-EPROM, so that the power off or power failure has no influence on the user data.

Differences between SIJECT 15 and 16

The differences between SIJECT 15 and SIJECT 16 lie in their different PLC configuration:

Table 1-1 Differences between SIJECT15 and SIJECT16

PLC configuration	SIJECT 15	SIJECT 16
Hardware	No Hardware	SIMATIC S7-300
Software	SIJECT Project Tool	SIMATIC Manager

1.2 Technical Data

Connected load

Table 1-2 Connected load

Parameter	Min	Type	Max	Unit	Remarks
Supply voltage	100	220	250	V	
Input frequency	47	50	63	Hz	
Power of CI and OP			40	W	
Current consumption of outputs		2		A	
Digital input/output Proportional valve Relays		24 24/38 24/220		V V V	 * **

* It depends on the resistance of proportional valve.
** It can be supplied with DC24V or AC220V.

Weight

Table 1-3 Weight

Component	Weight (Kg)
CI component	4.1
OP component	1.8

Dimensions

Table 1-4 Component Dimensions

Component	Dimensions: H×W×D (mm)
CI component	390×288×70 (CI15+) 390×288×84.5 (CI16)
OP component	392×202×36

Environmental operating conditions

Table 1-5 Environmental operating conditions

Parameter	
Temperature range	0 ~ +.50°C
Permissible relative humidity	5...95% without condensation
Air pressure	700...1,060hPa

Transport and storage conditions

Table 1-6 Transport and storage conditions

Parameter	
Temperature	Transport: -40~+70°C Storage: -20~+55°C
Permissible relative air humidity	5...95% without condensation
Air pressure	700...1,060hPa
Transport height	-1,000…3,000 m

Free fall in transport package	500mm

Protective quality and degree of protection

Class of protection level to IEC 536, CI: IP20, OP: IP54
PE terminal required.
Foreign matter and water protection to IEC 529.

System characteristics

Table1-7 System characteristics

System	SIJECT 15	SIJECT 16	
Type	SIJECT 15+	SIJECT16 (International)	SIJECT16 DP (International)
PLC controller	SIJECT Project Tool	SIMATIC S7-314	SIMATIC S7-315
Main controller	CI 15+	CI16	CI16DP
Digital input	23	31	31
High speed counter input	1	1	1
Digit output	24	24	24
Relay output	6	8	8
Temperature zone	5+1	8	8
Thermocouple type	K/J	K/J	K/J
Linear scale	3	4	4
Proportional valve	2	4	4
HMI	320x240	320x240	320x240
Back light	CCFL	CCFL	CCFL
Programming interface	RS232	MPI	MPI
OP interface	1	1	1
P-bus	-	1	1
Profibus	-	-	1
MMC card	1	1	1
Power supply	AC100~250V	AC100~250V	AC100~250V

1.3 Order Number

General

The SIJECT series product can be ordered in the form of package. But you also can receive the components separately if you only order the option. It depends on the configuration and can meet your requirements furthest. Please see the order number of all components in the following table.

Table 1-8 Order Number

No.	Component	MLFB (Order No.) / SNC No.
1	SIJECT15^{+} (OP15B)	6AT1131-5CC20-0XB0
2	SIJECT15^{+}	6AT1131-5CC20-0XA0
3	SIJECT16 (international)	6AT1131-6CD20-0XA0
4	SIJECT16DP (international)	6AT1131-6CE20-0XA0
5	OP15B	6AT1131-5BB20-0XB0
6	CI15^{+}	6AT1131-5DC20-0AA0
7	CI16 (international)	6AT1131-6DD20-0AA0
8	CI16DP (international)	6AT1131-6DE20-0AA0
9	Communication cable	6AT1131-0EA00-0AA0
10	SIJECT adapter	6AT1131-0FA00-0AA0
11	Multimedia Card (MMC card)	6AT1131-0GA00-0AA0
12	SIJECT PTPS (SIJECT Project Tool), English Version (SW)	6AT1131-5DA00-0BA0
13	SIJECT Sijload (SIJECT Loader), English Version (SW)	6AT1131-5CA00-0BA0
14	SIMATIC Manager V5.0	6ES7810-4CC04-0YX0
15	Short Guide for Start-up	SNC_184 000 000 028
16	Operation Manual SIJECT15/16, English	6AT1931-5AB41-0BA1
17	Operation Manual SIJECT15/16, Chinese	6AT1931-5AB41-0KA1
18	Start Up Manual SIJECT15/16, English	6AT1931-5AB61-0BA1
19	Start Up Manual SIJECT15/16, Chinese	6AT1931-5AB61-0KA1
20	P_bus cable (2.5m)	6ES7368-3BC51-0AA0
21	P_bus cable (5.0m)	6ES7368-3BF01-0AA0
22	Profi_bus cable	6XV1830-0EH10-1AB0
23	Profi_bus Connector 1	6ES7972-0BA40-0XA0
24	Profi_bus Connector 2	6ES7972-0BB40-0XA0
25	Lithium battery	SNC_000 000 575 332

2 Installing the Control System

Contents

Section	Heading	Page
2.1	Installing and dismounting	2-2
2.2	Interface and cabling	2-6
2.3	Connecting the individual components of CI	2-11
2.3.1	Connecting the Operator Panel (X11)	2-12
2.3.2	Pin assignments of the RS232/MPI interface (X12)	2-13
2.3.3	Pin assignments of the P_bus interface (X14)	2-14
2.3.4	Pin assignments of the Profibus interface (X15)	2-15
2.3.5	Connecting the Digital Inputs (X203, X204, X205, X206)	2-16
2.3.6	Connecting the Thermocouples (X200, X201)	2-19
2.3.7	Connecting the linear scale (X200)	2-21
2.3.8	Connecting the digital outputs (X300, X301, X302)	2-23
2.3.9	Connecting the Relay outputs (X303, X304)	2-26
2.3.10	Connecting the Analog outputs (X305, X306, X307)	2-28
2.4	Power supply	2-30
2.5	Grounding	2-32
2.6	LEDs and Mode selector S1	2-34

2.1 Installing and Dismantling

Warning

Do not install when the equipment is live! Do not dismantle when the equipment is live!

The modules contain electrostatically sensitive devices. It must be ensured that persons without ESD protection never touch printed circuit boards or components when handling operator panel (OP) and CI unit.

Procedure

Prior to installation, you should prepare 4 nuts (M3) for OP installation and 4 cross-head screws (M4) for CI installation. The sheet metal can not have any paint. The thickness of a sheet metal for mounting shall not be less than 2 mm.

1. Install the CI within the electrical cabinet
2. Install the Operator Panel on the control rack of injection molding machine
3. Connect CI and OP with communication cable
4. Connect the wiring of periphery circuit (I/Os, thermocouple, linear scale, proportional valve, etc.)
5. Connect entry wire of power supply (AC220V)

Dismantling the control system

The control components are dismantled as described above in the reverse order.

Danger

Install grounding connection before plug-in of screw-terminal block to AC220V mains.

Make sure that all delivered interface connectors (female) are plugged in before operation.

Do not interchange connectors, special in case of AC220V in use for X303 and X304!

Battery set-up[1]

Operating sequence:

1. Open the battery cover. Plug in the plug on the end of the battery cable into the connector of the CI board (Pay attention to the pole of battery!);

[1] It is only applicable for SIJECT 16 international /16DP international.

2. Switch on the system and observe the status of LEDs: SF (red) and STOP (yellow). At this time; the SF (red) should light up and the STOP (yellow) flash. PLC should be reset;
3. Switch S1 to position 1 (MRES), then to position 2 (STOP) and wait for one second;
4. Switch S1 to position 1 (MRES) again, then to position 4 (RUN-P);
5. Observe the status of LEDs: SF (red), STOP (yellow) and RUN (green) The system is ready if SF (red) and STOP (yellow) are switched off and the green RUN LED is switched on;
6. Battery installation is finished and assemble the cover;
7. Download the PLC program.

Note

In case that SF (red) keeps bright and STOP (yellow) is always flashing in the above-mentioned process, step 3 and 4 must be repeated until both LEDs go dark.

Battery Replacement[2]

Steps:

1. When battery alarm occurs, the lithium battery must be replaced;
2. Open the cover of the battery when power on;
3. Pull out the used lithium battery;
4. Replace it with a new one;
5. Assemble the cover and screw it.

Warning

During operation, the system must be always powered on.

There is risk of fire, explosion or combustion. Do not recharge, disassemble, crush, heat above 212 ℉ (100℃), or incinerate.

Mounting dimensions

The dimensions shown below are important when installing the control components:

[2] It is only applicable for SIJECT 16 international /16DP international.

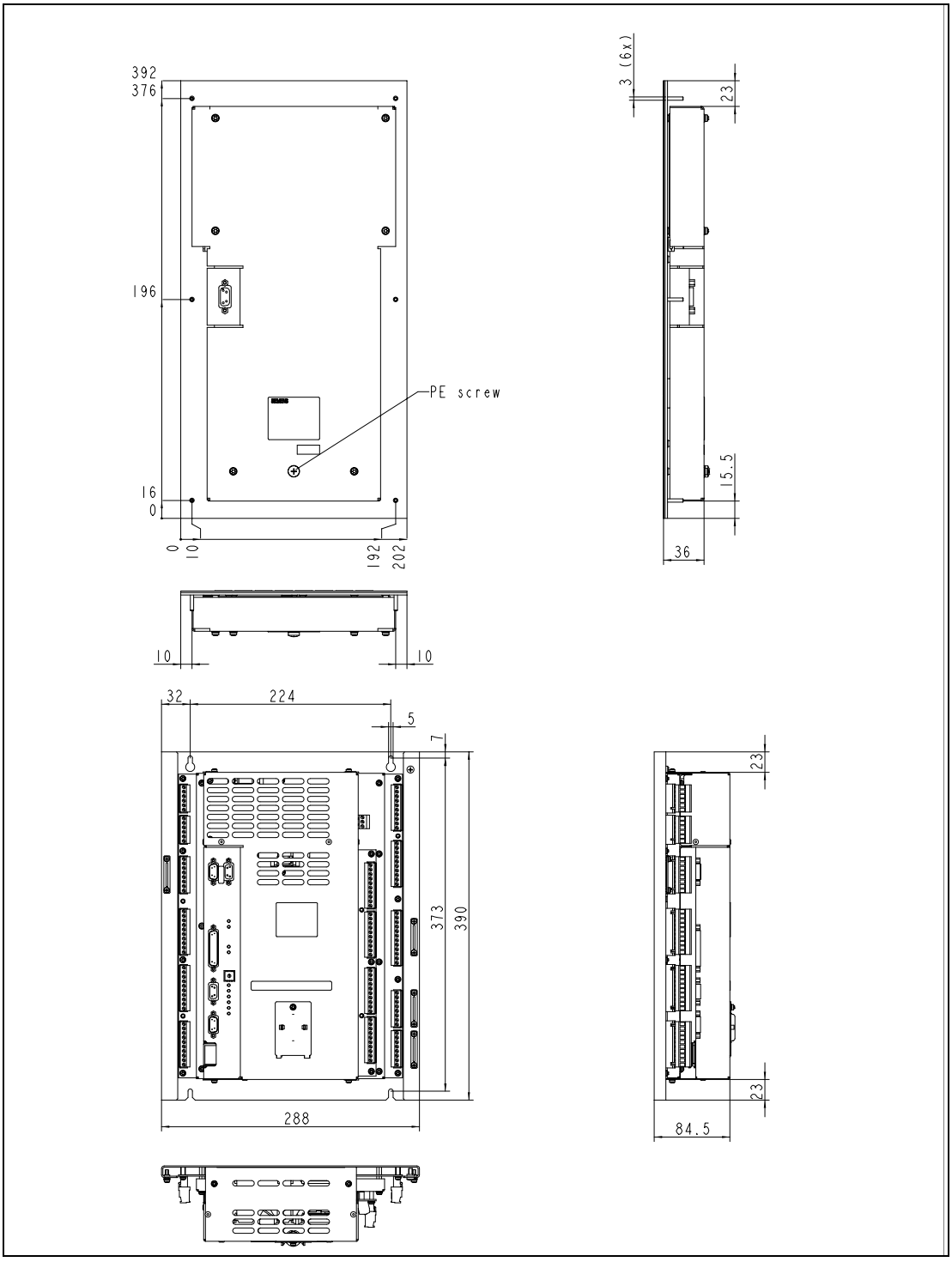


Fig 2-1 Mounting dimensions for SIJECT 15/16 OP15B and CI16 (also applicable for CI15+)

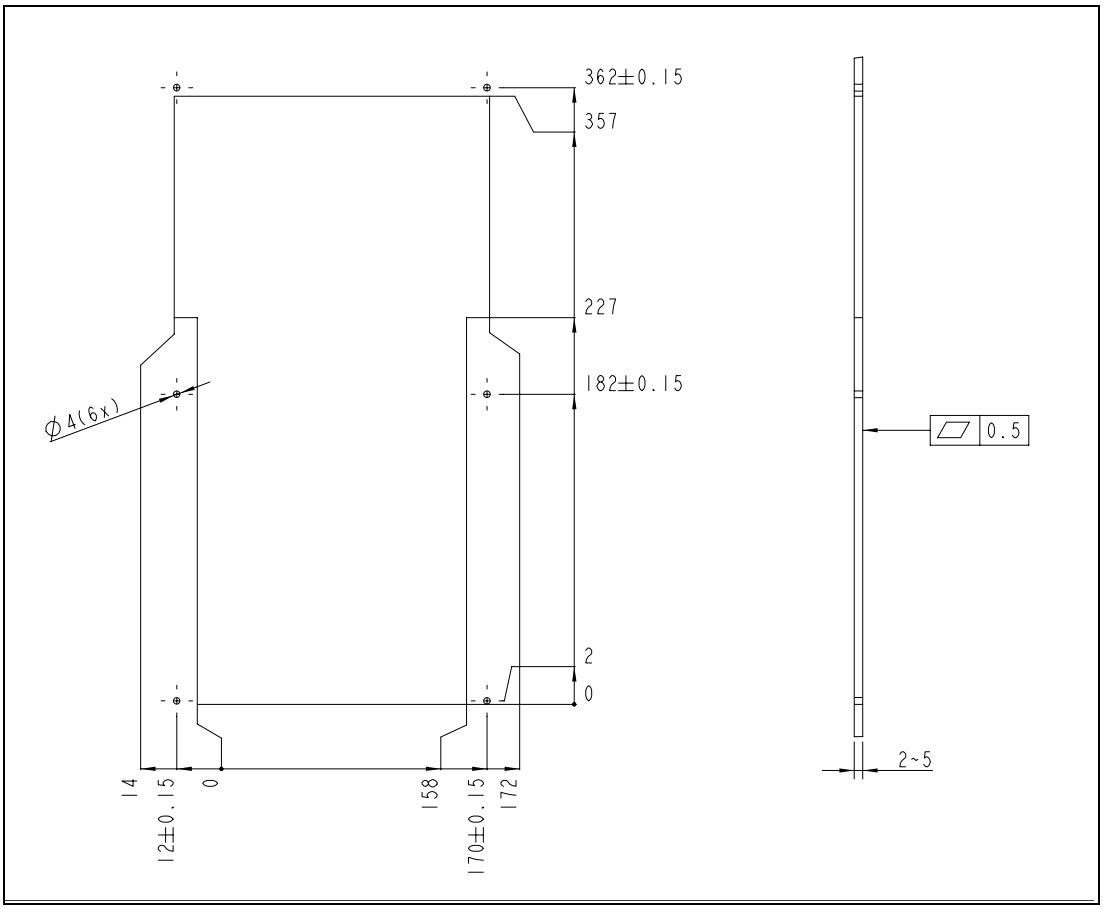


Fig. 2-2 Section dimension for OP15B

2.2 Interfaces and cabling

Position of interfaces and front panel elements

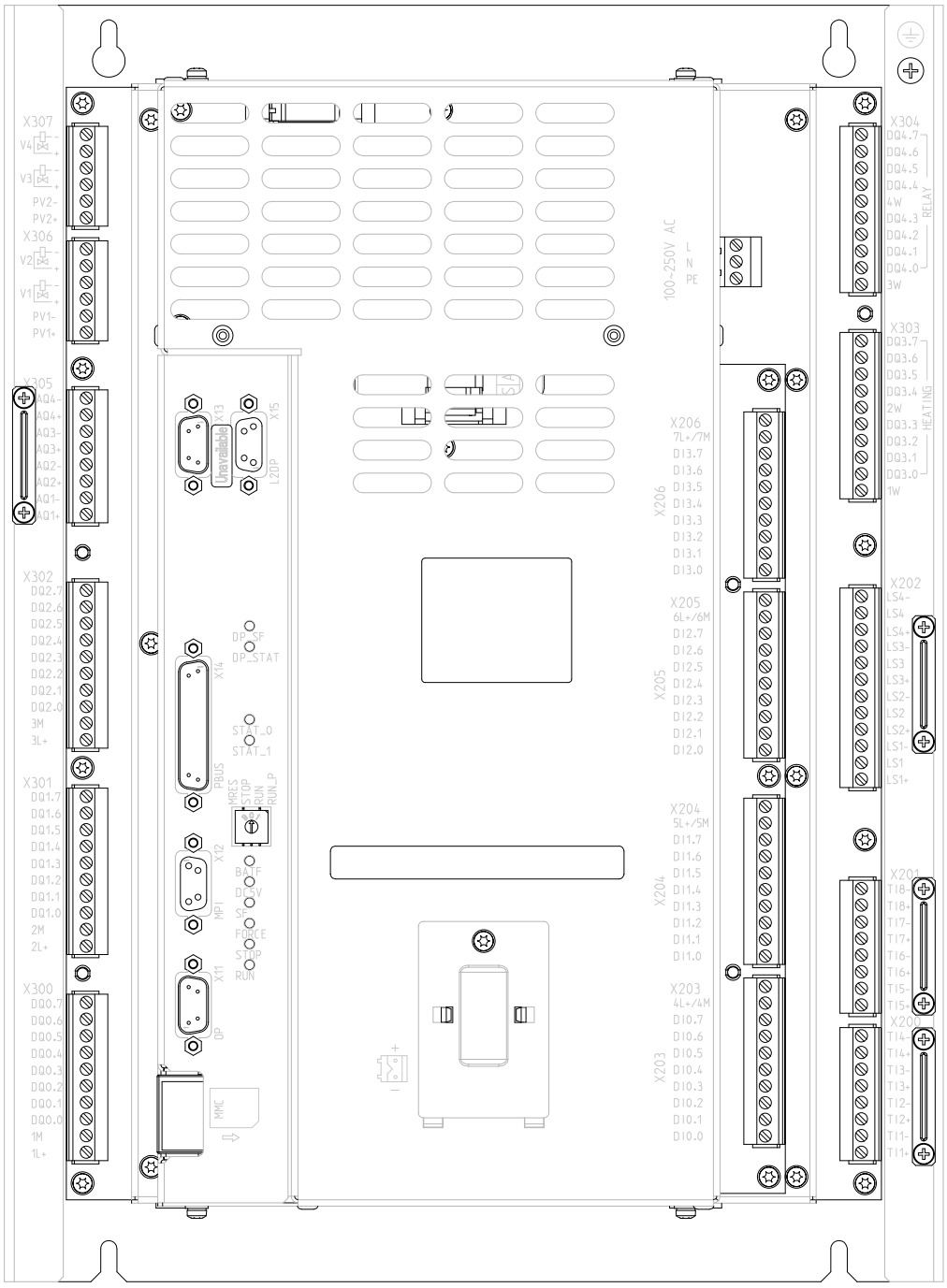


Fig. 2-3 User interfaces for SIJECT 16/16DP international (for reference)

Interfaces

CI

- **Power supply connector (AC220V)**
  3 – pin screw-terminal block for connecting the AC220V load power supply
- **X11 — OP interface**
  9 – pin sub-D plug connector for connecting OP and providing power supply for OP
- **X12 — MPI / RS232 interface**
  9 – pin sub-D socket for communicating with PC/PG and other standard OP
- **X14[3] — P_bus**
  25 – pin sub-D socket for periphery extension
- **X15[4] — Profi_bus**
  9 – pin sub-D socket for connecting controller (Profi_bus protocol)
- **X200, X201 — Temperature input**
  8 – pin front connector (2 sets) for connecting thermocouple inputs
- **X202 — Analog input**
  12 – pin front connector (1 set) for connecting linear scale inputs
- **X203, X204, X205, X206 — Digital input**
  10 – pin front connector (4 sets) for connecting digital inputs, 1 pin of them (DI3.7/X206) is adapted for connecting high-speed input including proximity switch
- **X300, X301, X302 — Digital output**
  10 – pin front connector (3 sets) for connecting digital outputs
- **X303, X304 — Relay output**
  10 – pin front connector (2 sets) for connecting heating relay and common relay
- **X305 — Analog output**
  8 – pin front connector (1 set) for connecting analog output for proportional pressure and flow valve with external driver card
- **X306, X307 — Power output**
  6 – pin front connector (2 sets) for connecting power output for proportional pressure and flow valve with integrated driver card.

OP

- **X21 — CI interface**
  9 – pin sub-D socket for connecting CI

LEDs 10 LEDs for fault and status displays

Operating elements Mode selector S1

[3] It is only applicable for SIJECT 16 international /16DP international.
[4] It is only applicable for SIJECT 16DP international.

Connecting cables The components are wired up as shown in the Connection Diagram 2-4. Please refer to this Figure for the type of cables required.

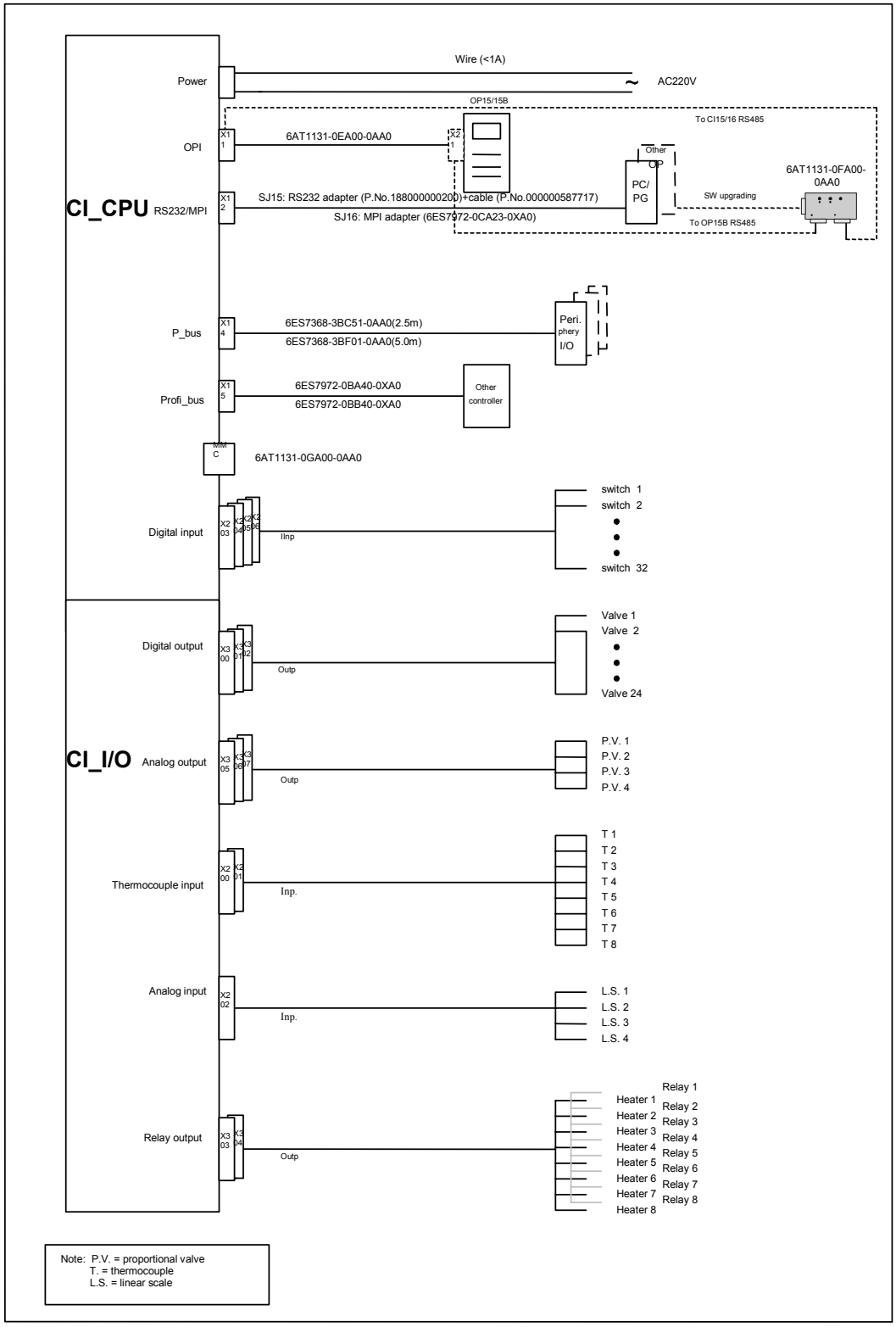


Fig. 2-4 Connection Diagram for SIJECT 15/16

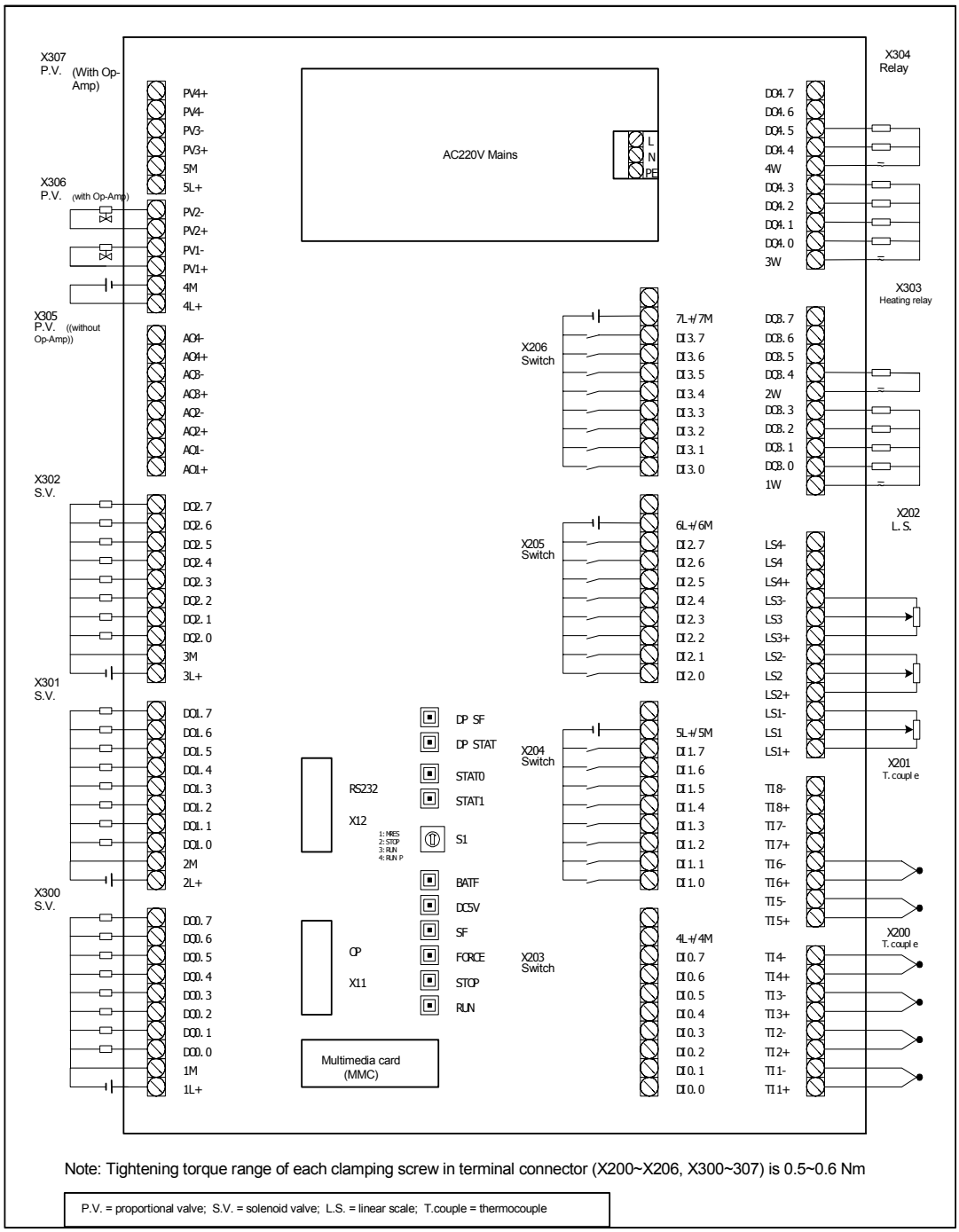
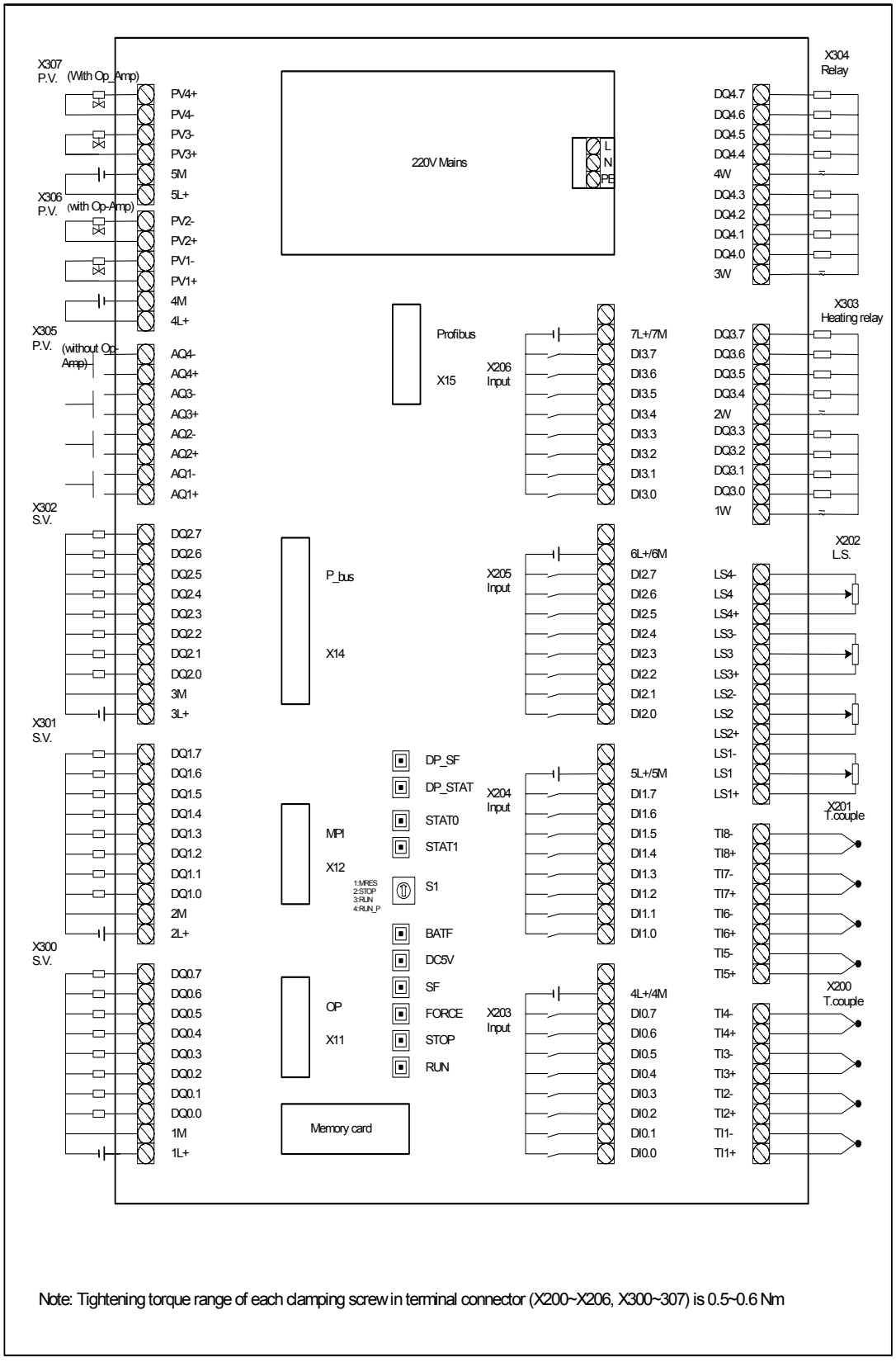


Fig. 2-5 Connection Diagram for CI of SIJECT 15+



Note: Tightening torque range of each clamping screw in terminal connector (X200~X206, X300~307) is 0.5~0.6 Nm

Fig. 2-6 Connection Diagram for CI of SIJECT 16 Int/16DP Int.(P-Switch)

2.3 Connecting the Individual Components of CI

Connecting the Components

Please note the following:

Note

Use only shielded cable and make sure that the shield is connected with the metal or metal plated connector casing on the control side.

The cable offered as accessories provides optimum protection against interference.

Proceed as follows to connect the individual components:

1. Connect the lines to the components as shown in Fig.2-5/2-6;
2. Fix the sub-D connector using screws.

2.3.1 Connecting the Operator Panel (X11)

Pin assignments for connector on CI side

Operator panel interface

Connector designation: X11
OP15

Connector type: 9 – pin sub-D plug connector

Table 2-1 Pin assignments of connector X11

X11		
Pin	Signal	Type
1	M	V
2	XBOOT	I
3	TXD+	O
4	RXD+	I
5	P24	V
6	XRES	I
7	RXD-	I
8	TXD-	O
9	M24	V

Pin assignments for connector on OP side

CI interface

Connector designation: X21
CI15/16

Connector type: 9 – pin sub-D socket connector

Table 2-2 Pin assignments of connector X21

X21		
Pin	Signal	Type
1	M	V
2	XBOOT	I
3	RXD+	O
4	TXD+	I
5	P24	V
6	XRES	I
7	TXD-	I
8	RXD-	O
9	M24	V

2.3.2 Pin assignments of the RS232/MPI Interface (X12)

Pin assignments for connector

MPI (RS232) interface

Connector designation: X12
Rs232/MPI

Connector type: 9 – pin sub-D socket connector

Table 2-3 Pin assignments of CI15+ connector X12

X12 (RS232)		
Pin	Signal	Type
1	RS232_RXD_DIAG	I
2	RS232_TXD_SOFTPLC	O
3	RS232_RXD_SOFTPLC	I
4	RS232_TXD_DIAG	O
5	M	V
6	No connection	N.C
7	No connection	N.C
8	No connection	N.C
9	No connection	N.C

Table 2-4 Pin assignment of CI16 connector X12

X12 (MPI)		
Pin	Signal	Type
1	RS232_RXD_DIAG	I
2	M24	M
3	MPI_P	V
4	RS232_TXD_DIAG	O
5	M	M
6	P5	V
7	P24	V
8	MPI_N	M
9	MPI_RTS	I

2.3.3 Pin assignments of the P_bus Interface (X14)

Pin assignments for connector

P_bus interface

Connector designation: X14
P_bus

Connector type: 25 – pin sub-D socket connector

Table 2-5 Pin assignments of connector X14

X14		
Pin	Signal	Type
1	RS_ALARM_N	I
2	IM_ADR0_N	O
3	IM_ADR1_N	O
4	IM_ADR2_N	O
5	M	V
6	KBUS_B_N	B
7	RS_OD_N	O
8	RS_DIDO_N	B
9	RS_CLK_N	O
10	RS_COM_N	O
11	RS_LST_N	O
12	RS_READY_N	I
13	No connection	N.C
14	RS_ALARM	I
15	IM_ALARM0	O
16	IM_ALARM1	O
17	IM_ALARM2	O
18	K<2>	O
19	KBUS_B	B
20	RS_OD	O
21	RS_DIDO	B
22	RS_CLK	O
23	RS_COM	O
24	RS_LAT	O
25	RS_READY	I

Note

This interface can not be used as K-Bus interface (SIMATIC K-Bus), because the internal pin 6 and 19 have no wire.

2.3.4 Pin assignments of the Profi_bus Interface (X15)

Pin assignments for connector

Profi_bus interface

Connector designation: X15
Profi_bus

Connector type: 9 – pin sub-D socket connector

Table 2-6 Pin assignments of connector X15

X15		
Pin	Signal	Type
1	Not connect	N.C.
2	Not connect	N.C.
3	DP_P	B
4	Not connect	N.C.
5	M	V
6	P5	V
7	Not connect	N.C.
8	DP_N	B
9	Not connect	N.C.

2.3.5 Connecting the Digital inputs (X203, X204, X205, X206)

Pin assignments for connector

Interface for digital inputs

Connector designation: X203, X204, X205, X206
In

Connector type: 10-pin plug connector

Table 2-7 Pin assignments of connector

X203		
Pin	Name	Type
1	DI0.0	I
2	DI0.1	I
3	DI0.2	I
4	DI0.3	I
5	DI0.4	I
6	DI0.5	I
7	DI0.6	I
8	DI0.7	I
9	P24	V
10		
X204		
Pin	Name	Type
1	DI1.0	I
2	DI1.1	I
3	DI1.2	I
4	DI1.3	I
5	DI1.4	I
6	DI1.5	I
7	DI1.6	I
8	DI1.7	I
9	P24	V
10		
X205		
Pin	Name	Type
1	DI2.0	I
2	DI2.1	I
3	DI2.2	I
4	DI2.3	I
5	DI2.4	I
6	DI2.5	I
7	DI2.6	I
8	DI2.7	I
9	P24	V
10		
X206		
Pin	Name	Type
1	DI3.0	I
2	DI3.1	I
3	DI3.2	I
4	DI3.3	I
5	DI3.4	I
6	DI3.5	I
7	DI3.6	I
8	DI3.7	I
9	P24	V
10		

Input voltage

Signal 1	±9V~30V
Signal 0	0~±5V

Input current

Signal 1	6mA

Connecting sensors and actuators

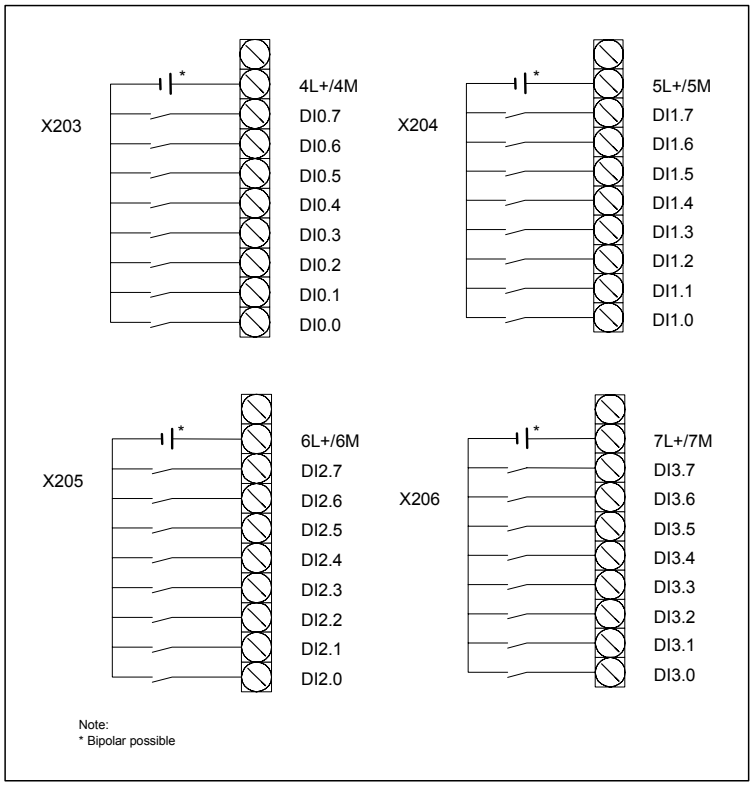


Fig.2-7 Connecting the digital inputs

Signal description The digital inputs are assigned with the following signals:

DI 0.0	（ spare ）
DI 0.1	（ spare ）
DI 0.2	（ spare ）
DI 0.3	（ spare ）
DI 0.4	（ spare ）
DI 0.5	（ spare ）
DI 0.6	（ spare ）
DI 0.7	（ spare ）
DI 1.0	Safety door 2 (short-cut available)
DI 1.1	Rear safety door (short-cut available)
DI 1.2	Emergency stop (short-cut available)
DI 1.3	Carriage advance end
DI 1.4	Carriage retract end
DI 1.5	Ejector advance end
DI 1.6	Ejector retract end
DI 1.7	Mold lock end
DI 2.0	Mold adjustment advance end
DI 2.1	Mold adjustment retract end
DI 2.2	Core 1 in end / Screwing 1
DI 2.3	Core 1 out
DI 2.4	Core 2 in end / Screwing 2
DI 2.5	Core 2 out
DI 2.6	Injection door (short-cut available)
DI 2.7	Motor overload
DI 3.0	Safety door 1
DI 3.1	Lubrication error
DI 3.2	Mold adjustment photo-sensor
DI 3.3	Full-auto photo-sensor
DI 3.4	Robot
DI 3.5	Core 3 in end / Screwing 3
DI 3.6	Core 3 out
DI 3.7	Screw speed sensor

2.3.6 Connecting the Thermocouples (X200, X201)

Pin assignments for connector

Interface for thermocouple

Connector designation: X200, X201
In
Connector type: 8-pin plug connector

Table 2-8 Pin assignments of connector

X200		
Pin	Name	Type
1	TI1+	V
2	TI1-	V
3	TI2+	V
4	TI2-	V
5	TI3+	V
6	TI3-	V
7	TI4+	V
8	TI4-	V
X201		
Pin	Name	Type
1	TI5+	V
2	TI5-	V
3	TI6+	V
4	TI6-	V
5	TI7+	V
6	TI7-	V
7	TI8+	V
8	TI8-	V

Sensor

Thermocouple K/J
Temperature range 0~700 °C
Absolute accuracy ±3K

A/D-characteristics

Resolution 16bit
Sampling rate 2s

Connecting sensor

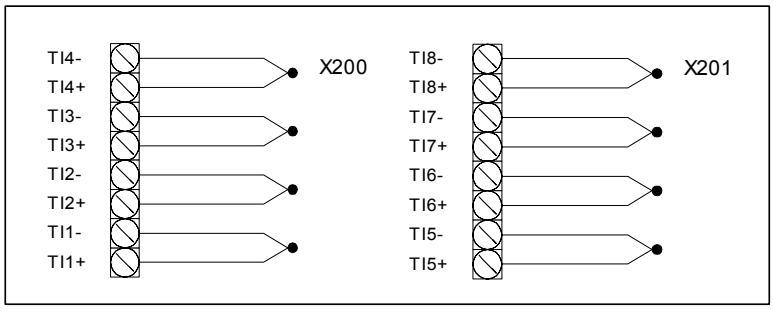


Fig. 2-8 Connecting the thermocouple

Signal description The analog inputs are assigned with the following signals:

TI1+,TI1-	TC : 1
TI2+,TI2-	TC : 2
TI3+,TI3-	TC : 3
TI4+,TI4-	TC : 4
TI5+,TI5-	TC : 5
TI6+,TI6-	TC : 6
TI7+,TI7-	(spare)
TI8+,TI8-	(spare)

2.3.7 Connecting the linear scale (X202)

Pin assignments for connector

Interface for linear scale

Connector designation: X202
In
Connector type: 12-pin plug connector

Table 2-9 Pin assignments of connector

X202		
Pin	Name	Type
1	LS1+	V
2	LS1	V
3	LS1-	V
4	LS2+	V
5	LS2	V
6	LS2-	V
7	LS3+	V
8	LS3	V
9	LS3-	V
10	LS4+	V
11	LS4	V
12	LS4-	V

Sensor

Type	linear scale
Resistance value	1KΩ~10KΩ
Accuracy	±1%

A/D-characteristics

Resolution	12bit
Sampling rate	2ms

Connecting sensor

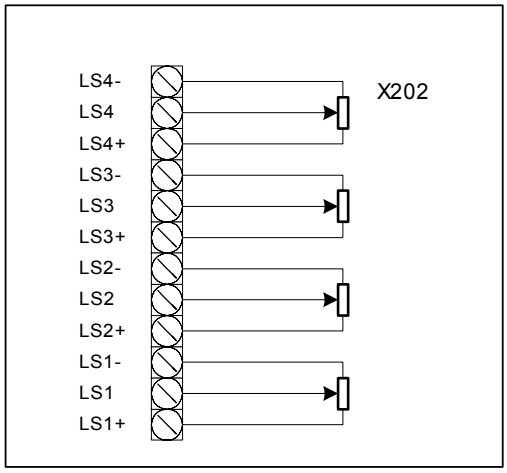


Fig.2-9 Connecting the linear scales

Signal description

The analog inputs are assigned with the following signals:

LS1+,LS1,LS1-	linear scale 1 (0-10v): Mold
LS2+,LS2,LS2-	linear scale 2 (0-10v): Injection
LS3+,LS3,LS3-	linear scale 3 (0-10v): Ejector
LS4+,LS4,LS4-	linear scale 4 (0-10v): Carriage

2.3.8 Connecting the Digital outputs (X300, X301, X302)

Pin assignments for connector

Interface for digital outputs

Connector designation: X300, X301, X302
Out

Connector type: 10-pin plug connector

Table 2-10 Pin assignments of SIJECT 15/16 connector

X300		
Pin	Name	Type
1	1L+	V
2	1M	V
3	DQ0.0	O
4	DQ0.1	O
5	DQ0.2	O
6	DQ0.3	O
7	DQ0.4	O
8	DQ0.5	O
9	DQ0.6	O
10	DQ0.7	O
X301		
Pin	Name	Type
1	2L+	V
2	2M	V
3	DQ1.0	O
4	DQ1.1	O
5	DQ1.2	O
6	DQ1.3	O
7	DQ1.4	O
8	DQ1.5	O
9	DQ1.6	O
10	DQ1.7	O
X302		
Pin	Name	Type
1	3L+	V
2	3M	V
3	DQ2.0	O
4	DQ2.1	O
5	DQ2.2	O
6	DQ2.3	O
7	DQ2.4	O
8	DQ2.5	O
9	DQ2.6	O
10	DQ2.7	O

Voltage

Rated load voltage	24V
Max. load voltage	28,8V

Current

Rated load current	2A
Max. load current	2,4A
Short-circuit protection	Yes
Simultaneity factor	50%

Connecting sensor and actuators

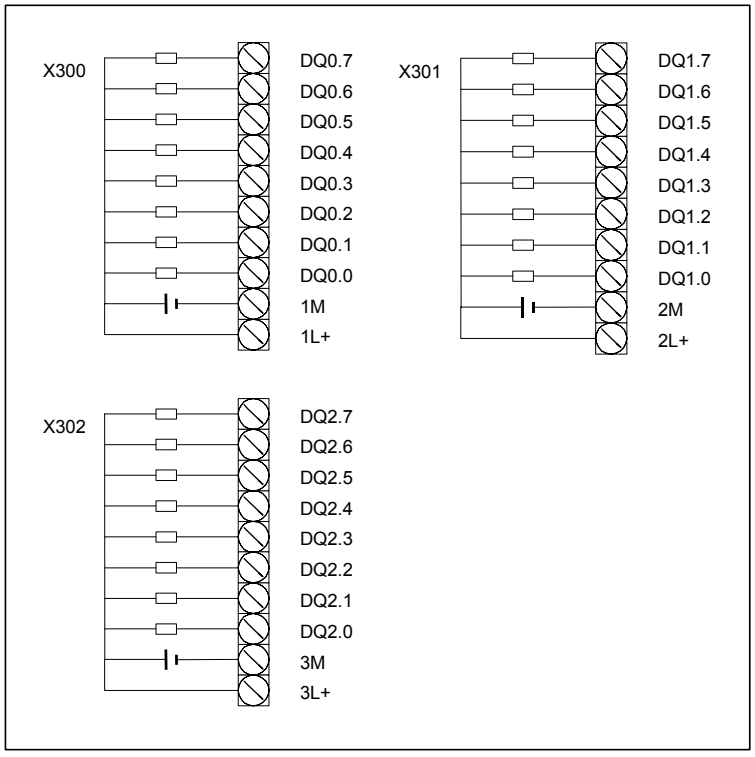


Fig.2-10 Connecting the digital outputs in SIJECT15+

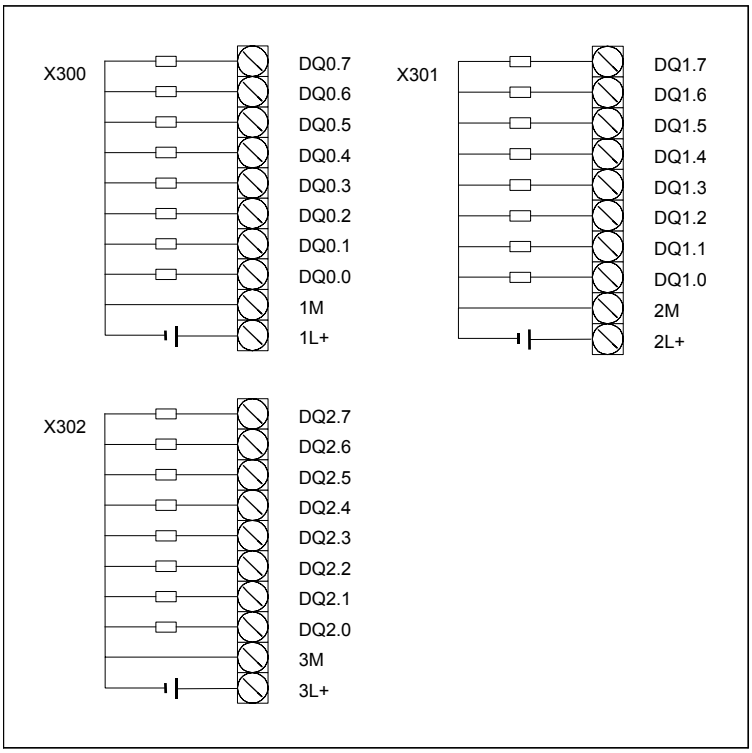


Fig.2-11 Connecting the digital outputs in SIJECT 16 Int.(P-Switch)

Signal description The digital outputs are assigned with the following signals:

DQ 0.0	Core 1 in valve
DQ 0.1	Core 1 out valve
DQ 0.2	Core 2 in valve
DQ 0.3	Core 2 out valve
DQ 0.4	Carriage advance valve
DQ 0.5	Carriage retract valve
DQ 0.6	Charge valve
DQ 0.7	Injection valve
DQ 1.0	Mold close valve
DQ 1.1	Mold close fast valve
DQ 1.2	Mold open valve
DQ 1.3	Mold open fast valve
DQ 1.4	Mold adjustment advance valve
DQ 1.5	Mold adjustment retract valve
DQ 1.6	Ejector advance valve
DQ 1.7	Ejector retract valve
DQ 2.0	Suck back valve
DQ 2.1	Pump 2
DQ 2.2	Zero back pressure valve
DQ 2.3	Air blow 1
DQ 2.4	Air blow 2
DQ 2.5	Core 3 in
DQ 2.6	Core 3 out
DQ 2.7	Robot

Note

The DC24V power supply should meet the requirements of the safe separation in accordance with DIN EN 50178.

The terminal M in the DC24V power supply for the digital output (Signals 1M –3M) are to be earthed additionally

Danger

The positive terminal of digital outlet lines (terminal $1L^+$ - $3L^+$) must be protected through a 10A fuse (See Fig.2-14).

The connection from DC24V power supply to the line L^+ and M may not be exchanged, otherwise it can bring about a destruction in the CI board!

2.3.9 Connecting the relay outputs (X303, X304)

Pin assignments for connector

Interface for relay outputs

Connector designation: X303, X304
Out
Connector type: 10-pin plug connector

Table 2-11 Pin assignments of connector

X303 (Heating relay)		
Pin	Name	Type
1	1W	V
2	DQ3.0	O
3	DQ3.1	O
4	DQ3.2	O
5	DQ3.3	O
6	2W	V
7	DQ3.4	O
8	DQ3.5	O
9	DQ3.6	O
10	DQ3.7	O
X304 (Common relay)		
Pin	Name	Type
1	3W	V
2	DQ4.0	O
3	DQ4.1	O
4	DQ4.2	O
5	DQ4.3	O
6	4W	V
7	DQ4.4	O
8	DQ4.5	O
9	DQ4.6	O
10	DQ4.7	O

Switching capacity

Max. switching voltage	250VAC, 110VDC
Rated current	0.5A
Max. switching current	3A (250VAC, 30VDC)
Min. switching capacity	100μA (100mVDC)
Switching frequency	1Hz

Connecting sensor and actuators

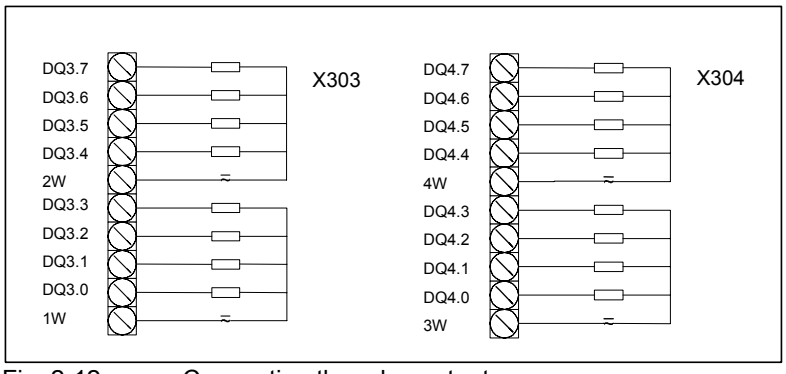


Fig. 2-12 Connecting the relay outputs

Signal description

The relay outputs are assigned with the following signals:

DQ 3.0	Heater output 1
DQ 3.1	Heater output 2
DQ 3.2	Heater output 3
DQ 3.3	Heater output 4
DQ 3.4	Heater output 5
DQ 3.5	Heater output 6
DQ 3.6	Heater output 7
DQ 3.7	Heater output 8
DQ4.0	Motor star start
DQ4.1	Motor triangle start
DQ4.2	Motor start
DQ4.3	Alarm light
DQ4.4	Lubrication pump
DQ4.5	Alarm buzzer
DQ4.6	(spare)
DQ4.7	(spare)

Warning

Special care must be taken when connecting the relay to AC220V power supply. AC220V should never be connected to digital input/output, otherwise the circuit will be burned-out.

Note

It is strongly recommended that SSR (Solid State Relay) should be used to control barrel heating in the plastic machine, in order that the relay life-time can be extended considerably.

2.3.10 Connecting the analog outputs (X305, X306, X307)

Pin assignments for connector

Interface for analog outputs

Connector designation: X305, X306, X307
Out
Connector type: 8-pin and 6 pin plug connector

Table 2-12 Pin assignments of connector

X305 (without integrated Op-Amp)**:** For 4 proportional valves		
Pin	Name	Type
1	AQ1+	V
2	AQ1-	V
3	AQ2+	V
4	AQ2-	V
5	AQ3+	V
6	AQ3-	V
7	AQ4+	V
8	AQ4-	V

Output characteristics

Voltage range	-10V~+10V
Max. output current	±5mA
Gain error	±1%
Offset error	±100mV
Resolution	10bit

Table 2-13 Pin assignments of connector

X306 (with integrated Op-Amp)**:** For PV 1 and PV 2		
Pin	Name	Type
1	4L+	V
2	4M	V
3	PV1+	O
4	PV1-	O
5	PV2+	O
6	PV2-	O
X307 (with integrated Op-Amp)**:** For PV 3 and PV 4		
Pin	Name	Type
1	5L+	V
2	5M	V
3	PV3+	O
4	PV3-	O
5	PV4+	O
6	PV4-	O

Output characteristics

Max. output current	1.42A
Max. valve Voltage	40V DC

Connecting sensor and actuators

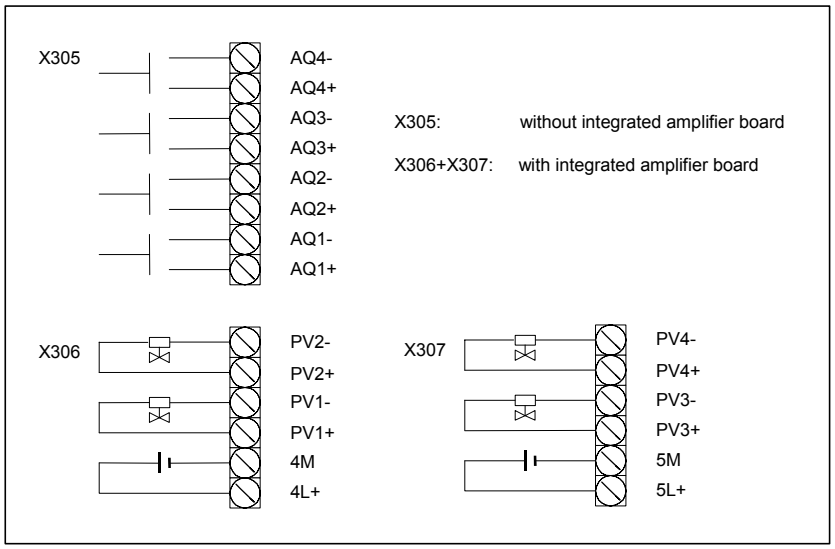


Fig. 2-13 Connecting the analog outputs

Signal description The analog outputs are assigned with the following signals:

AQ1+, AQ1-:	Pressure valve (0-140bar)
AQ2+, AQ2-:	Flow valve (0-100%)
AQ3+, AQ3-:	Back pressure valve (0-140bar)
AQ4+, AQ4-:	4th proportional valve

Or

PV1:	Pressure valve (0-140bar)
PV2:	Flow valve (0-100%)
PV3:	Backpressure valve (0-140bar)
PV4:	4th proportional valve

2.4 Power supply

Screw-terminal block

The AC220V load power supply unit required for supplying CI and OP is wired to screw-terminal block.
The minimum cross section of the wire is 0.75m^2.

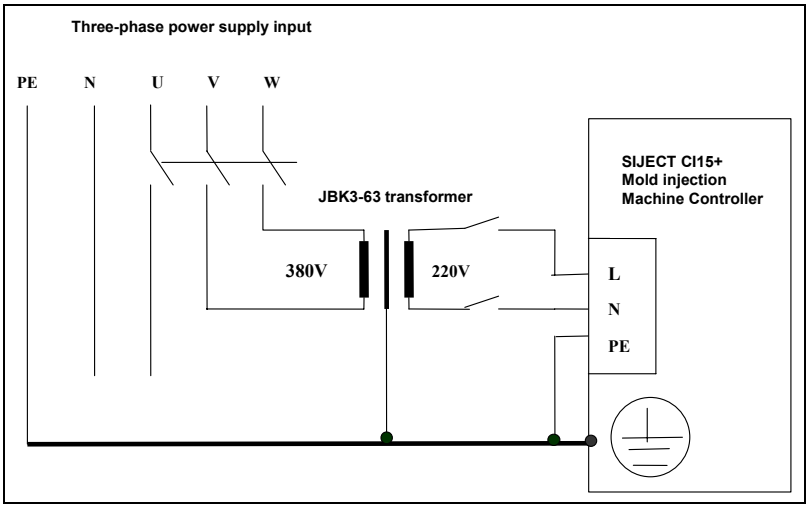


Fig. 2-14 Connection diagram of system power supply

Terminal assignments

Table 2-14 Terminal assignments of terminal board

Terminal		
1	L	Live
2	N	Neutral
3	PE	Protective earth

Characteristics of the load power supply

Table 2-15 Input specification

Parameters	Min.	Max.	Units
Rated input voltage	100	250	V
Range	90	270	V
Frequency	47	63	Hz
Fuse	On board fusing		
Ripple	Second level		

Table 2-16 Output specification

	Output voltage	Rated current	Voltage range	Load regulation	Remarks
Output 1	24.5V	1.5A	±1%	±1%	Max.40W
Output 2	+15V	0.3A	±5%	±5%	
Output 3	-15V	0.1A	±5%	±5%	
Linear regulation	±2%				
Ripple and noise	1%				20MHz BW
Supervision	All outputs have protection for over current and voltage.				

Table 2-17 General specification

Parameter	Min.	Max.	Unit
MTBF	50,000		Hour
Storage environment	-40	+80	°C
Operation environment	0	55	°C
EMC requirements	FCC class B; CISPR 22 class S		

Operator panel The operator panels does not have separate power supply terminals. It is supplied via the signal cable from the CI.

Digital input/output The digital inputs/outputs require an external DC24 switch power.

Relay output The relay outputs are rated at 250Vac/0.5A. They need a supply line of AC220V or DC24V.

Proportional valve The proportional valves need a separate switch power. It can be chosen in accordance with the type of proportional valve.

Caution

1. There is an isolation transformer JBK3-63VA with SIJECT 15+ system. Refer to Figure 2-14 Connection Diagram for its wiring.
2. Neutral line and Protection earth line must not be connected at any time.
3. Power supply cable and signal cable should be seperated, i.e., linear scale and thermocouple signal cable can not be assigned to the same conduit with power supply cable.

Note

The DC24V power supply should meet the requirements of the safe separation in accordance with DIN EN 50178.

The terminal M in the DC24V power supply for the digital output (Signals 1M –3M) are to be earthed additionally.

2.5 Grounding

Grounding Connections

The following grounding connections must be implemented:

- OP15B
- CI16

The grounding connection for the OP must be taken into account when installing the machine.

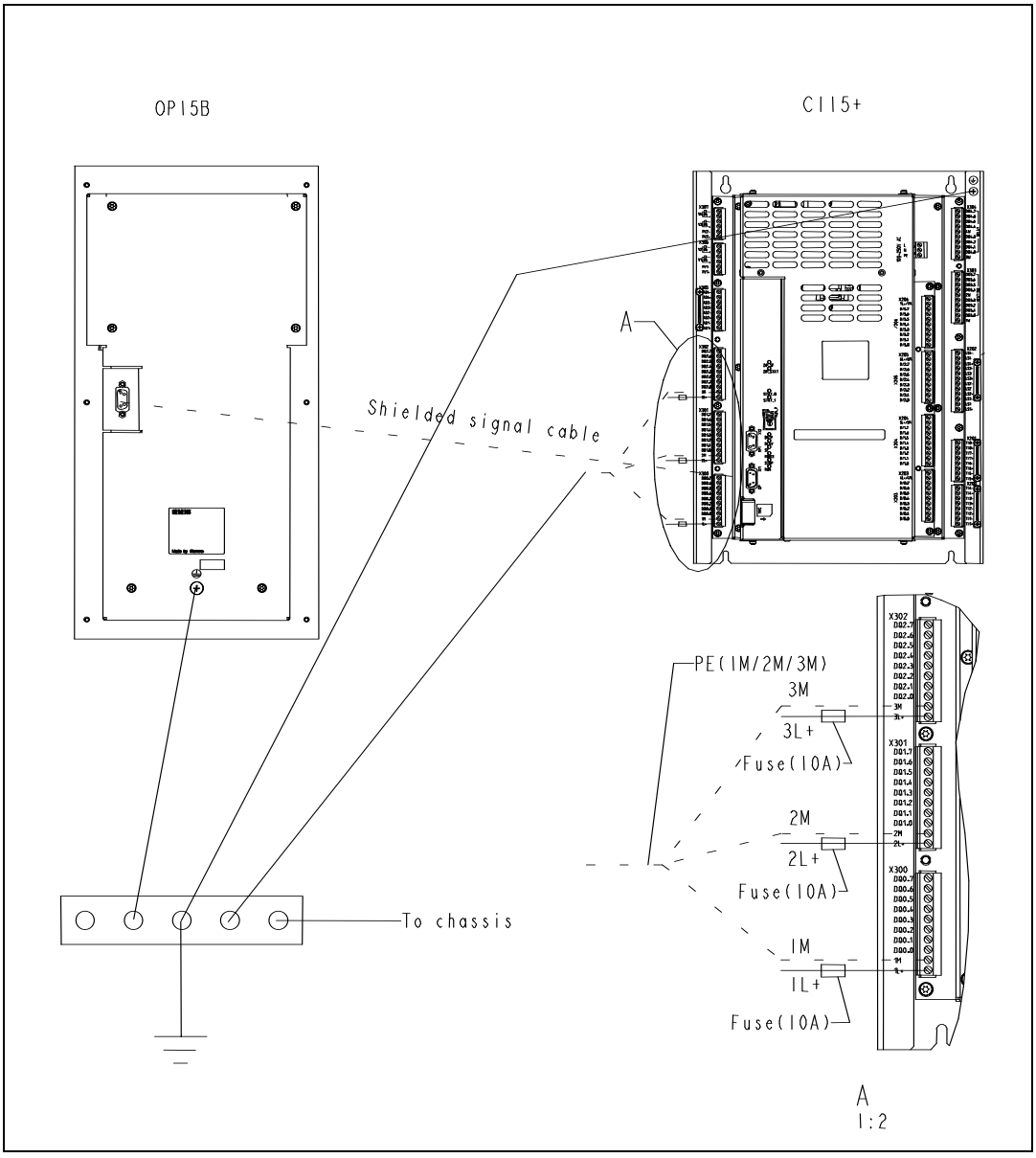


Fig.2-15 Grounding diagram for OP and CI

To ensure the normal operation of equipment, good grounding is required. Users are recommended to take following actions (according to GB/T5226.1-1996, eqv IEC204-1:1992):

1. The grounding wire should be Yellow/Green wire with cross section 2.5 mm^2;
2. Linear scale and both sides of the shield of thermocouple signal wire must be grounded well on the injection molding machine;
3. The shield of the AC380V/220V transformer within injection molding machine must be grounded well on the injection molding machine;
4. Metal sheet embedded underground can be used as earth wire. Water pipe or metal frame of building which are grounded well can also be used as earth wire;
5. To ensure the reliability of the grounding, copper lead should be welded with earth wire.

Danger

The grounding wiring must be finished prior to connecting AC220V!

2.6 LEDs and Mode selector S1

Error and status LEDs

There are 10 LEDs on the front panel of the CI.

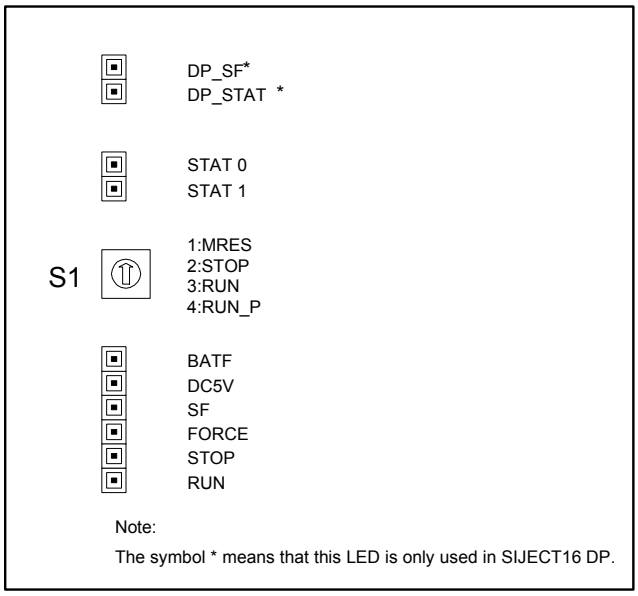


Fig. 2-16 Position of LEDs and mode selector S1

Meaning of LEDs

Table 2-18 Meaning of LEDs

LED	Meaning	Description	Remarks
DP_SF (red)	System Fault	Lights up if system is fault.	For CI16DP
DP_STAT (green)	System Normal	Lights up if system works normally.	For CI16DP
STAT0 (green)	CI Normal	Flashes at 1 second interval if CI is normal.	
STAT1 (red)	CI Fault	Lights up if CI is fault.	
BATF (red)	Battery Fault	Lights up if the battery is defective or not inserted.	Only for CI16 and CI16DP
DC5V (green)	Power Supply Error	The LED will be bright all the time if the DC 5V circuit is normal.	Check DC5V circuit.
SF (red)	System Error/Fault	LED flashes when there is: • Hardware faults • Firmware errors • Programming errors • Parameter assignment errors • Arithmetic errors • Timer errors • Defective memory card • Battery failure or no backup on power on • I/O fault/error (external I/O only)	You must use a programming device and read out the contents of the diagnostics buffer to determine the exact nature of the error/fault.

LED	Meaning	Description	Remarks
FORCE (yellow)	Force job	Lights up if a force job is active	
STOP (yellow)	STOP Mode	Lights up when CPU is not scanning the user program. Flashes at 1 second interval when CPU requests a memory reset.	
RUN (green)	RUN Mode	Flashes at 2Hz during CPU restart • At least continue 3s; however, CPU restart can be shorter after CPU restart • During the CPU restart, the STOP LED always lights up; when the STOP LED goes dark, the outputs are enabled.	

Mode selector S1

Mode selector S1 has 4 different positions. It depends on the Gray code.

Table 2-19 Mode selector S1

	GRAY 2	GRAY 1
MRES	0	1
STOP	0	0
RUN	1	0
RUN_P	1	1

Meanings

Table 2-20 Meaning of Mode selector S1

Position	Designation	Meaning
MRES	Memory Reset	Momentary-contact position of the mode selector for resetting the CPU memory. A special sequence must be observed when resetting the CPU memory with the mode selector, which is applicable for CPU312 IFM, 314 IFM.
STOP	STOP Mode	The CPU does not scan user programs. Programs can • Be read out of the CPU with a programming device (CPU→PG) • Be loaded into the CPU with a programming device (PG→CPU)
RUN	RUN Mode	The CPU scans the user program. Programs in the CPU can be read out with a programming device (CPU→PG). You cannot change the program in the load memory in the RUN mode!
RUN-P	RUN-Program Mode	The CPU scans the user program. Programs can • Be read out of the CPU with a programming device (CPU→PG) • Be loaded into the CPU with a programming device (PG→CPU)

3 Start-up

Contents

Section	Heading	Page
3.1	General	3-2
3.1.1	Access levels	3-3
3.1.2	Structure of recipe data	3-4
3.1.3	Handling of recipe data	3-5
3.1.4	Recipe data saving	3-6
3.2	Switching on and booting the control system	3-7
3.2.1	Boot messages	3-8
3.2.2	Alarm	3-11
3.3	Checking I/Os	3-13
3.4	Setting important parameters	3-15
3.4.1	Language selection	3-16
3.4.2	Service selection	3-17
3.4.3	Setting linear scale	3-19
3.4.4	Setting password	3-21
3.4.5	Save/load setting	3-22
3.4.6	Proportional valve adjustment	3-23
3.4.7	Pump combination setting	3-25
3.4.8	Lubrication setting	3-26
3.4.9	Temperature setting	3-27
3.4.10	Setting the ramp data	3-29
3.5	Up-/download PLC program	3-31

3.1 General

Start-up requirements

The following is required:

- **User Manual:** Operation Manual SIJECT 15/16
- **PC/PG:** Data exchange with control system
  - With RS232 adapter and SIMATIC S7-300 programming tool:
    for down-/upload PLC-program for SIJECT15
  - With MPI adapter and SIMATIC S7-300 programming tool:
    for down-/upload PLC-program for SIJECT16
  - With SIJECT adapter and Toolbox:
    for updating system software
- **MMC card:** can be used to transfer customer specific picture, recipe data and PLC-program

The mechanical and electrical installation of the equipment must be completed.

Note

For installation, refer to the installation description provided in the chapter 2 in this manual.

The control system with its components boots without errors.

Start-up Sequence

A possible start-up sequence for the SIJECT 15/16 is as follows:

1. Check whether the CI boots
2. Check the diverse versions of PLC, CI and OP
3. Check the I/Os via display and the LEDs in CI
4. Set recipe data
5. Optimize the data
6. Save the data

3.1.1 Access levels

User class

The SIJECT 15/16 implements a user class concept to enable certain data areas. The user classes have protection level 1 and 2.

User class 1

When setting the parameters via operator panel, the screen will display “Enter Password, XXXX”. User should enter the password of class 1. Factory setting for the password class 1 is **1111**. Then push the Enter key to confirm the entry.

After Switch-On of control system, if there is no action for 5 minutes, the system will require password entry for the second time when you operate again.

User class 2

User class 2 requires the **password 2** (2000) on the **Service** screen. It is set up so as to avoid the accidental modification of function parameters by the operator. They are the most important parameters with the influence on the machine function. Only the service engineer has the accessible right.

Caution

When changing the recipe parameters, every machine movement must be stopped!

3.1.2 Structure of recipe data

Definition

Recipe data is consisted of diverse values with different units. Usually, one set of recipe data contains the following parameters:

- Hydraulic pressure P
- Hydraulic flow F
- Movement position S
- Set time and actual time T
- Set temperature value and actual temperature value
- Counter number
- Mode selection number

User class

To set and change the general recipe data, user class 1 must be activated.

Start-up of the service parameters generally requires user class 2.

Unit

The physical units of the recipe data are set as follows:

Table 3-1 Recipe data unit

Parameter	Unit
Pressure P	bar
Flow F	%
Position S	mm
Timer T	second
Temperature	°C
Counter	No unit
Mode selection	No unit

Standard data

For convenience of the user, we deliver the controller with the integrated PLC-program. You should set and adjust the recipe data in compliance with the program.

No default recipe data exist in the control system with the version of the control supplied unless otherwise programmed.

3.1.3 Handling of recipe data

Handling methods

Display:

Input via keys and MMC card.

Making back-up copies and saving to MMC card

Loading the recipe data from MMC card

Alarm when Loading recipe data

If the process of loading recipe data from MMC card has errors, an alarm is output.

User can execute related operation according to the alarm.

Note

You should press **Enter key** to confirm your setting whenever any parameter has been changed.

3.1.4 Recipe Data Saving

Internal data saving

The recipe data on the screen can be automatically saved in the memory during operation. After power on for the next time, the saved recipe data will be recovered.

To avoid loss of the setting parameters, the recipe data should be saved internally before the control system is switched off. In the permanent memory, max.30 sets of recipe data with the relevant mould number can be saved.

It is recommended to carry out internal data saving whenever important data changes have been made.

Saving data internally:

Use the Save/Load key to enter save screen, and use Selection key to select “system”, then input recipe number (from 1 to 30)[5], then press Enter key to confirm your entry.

External data saving

Apart from internal data saving, the recipe data can also be saved externally, i.e. in MMC card. Max.50 sets of recipe data with the relevant mould number can be saved.

External data saving should be performed whenever series start-up has to be done.

Saving data externally:

- Plug the MMC card in the slot after the controller is switched off
- Use the Save/Load key to open the save/load screen
- Use Selection key to select MMC card
- Enter the value with the recipe number(in the range from 1 to 50)
- Press Enter key to confirm your entry

[5] If the number exceeds 30, the data can only be displayed and can not be saved. The screen will give message during operation.

3.2 Switching on and Booting the control system

Procedure

Visual inspect the system for:

- proper mechanical installation with tight electrical connections;
- power supply connection;
- connection for shielding and grounding.

Turn on the control system.

Note

If memory and **Mode selector S1** are set correctly, the control system boots.

Mode selector S1 (hardware)

The CI is provided with the **Mode selector** to assist start-up of the control system. This switch can be operated by a screwdriver.

Table 3-2 Mode selector setting

Position	Status	Meaning
1	MRES	Reset CPU memory
2	STOP	STOP mode
3	RUN	RUN mode
4	RUN-P	RUN PROGRAM mode

The switch should be in the **RUN** position when the control system works normally.

The position **RUN-P** must be held during the down-/uploading PLC-program.

Booting the control system

When the control system is turned on for the first time, an initial state of the control system is established automatically. All memory areas are initialized and are loaded with previously stored default data.

This initial state is the precondition for error-free start-up of the control system.

3.2.1 Boot messages

Displays on the screen

When the control system is booting, the booting process will be displayed on the screen as follows:

1. At first the customer specific picture is displayed for 3 seconds;
2. Then on the screen shows the “Information” menu for 3 seconds;
3. After this the “Monitoring” window will be opened.

LED signal

If the control system has booted without errors, the green **DC5V** LED will light up and the green **STAT1** LED (in SIJECT 15/15+/16) flash at 1 second interval or the green **DP_STAT** LED (in SIJECT 16DP) lights up.

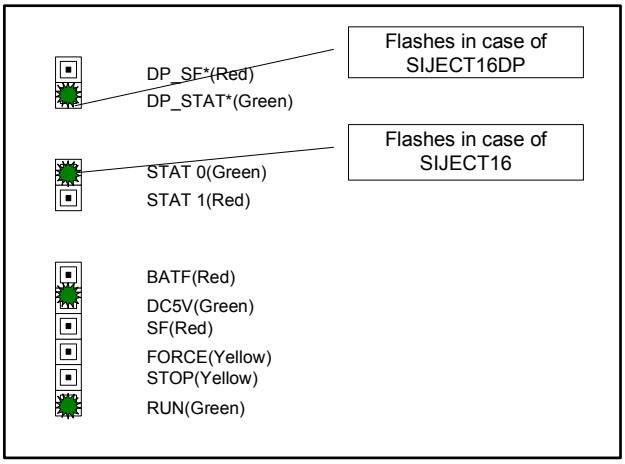


Fig. 3-1 LED signal

For any other case you can refer to Table 2-19 in section 2.6.

You also can check the booting status on the **Information screen 2** as follows:

1. Use the Information key to open the Information screen 1
2. Push the PgDn key to call the Information screen 2
3. Check the messages on the screen:
   - PLC Switch:
   - PLC Startup:
   - PLC LifeCnt:
   - OP Communication:
   - CI EEPROM:
   - CI type

Brightness adjustment

In case that the display brightness doesn’t match with the environment you can adjust the brightness using the Function key.

Steps are as follows:

1. Press Function key to enter function picture**;**
2. Press softkey F3 to increase the brightness, and press softkey F4 to decrease brightness.

In addition, screen back light can also be set on this screen. If selected, the screen will be black automatically in 3 minutes; if not selected, the screen will always have display. Refer to “SIJECT 15/16 Operation Manual” for detailed operation procedure

Note:

For the first operation, password class 1 (1111) should be entered.

Display sequence

Display screen 1: Customer specific picture

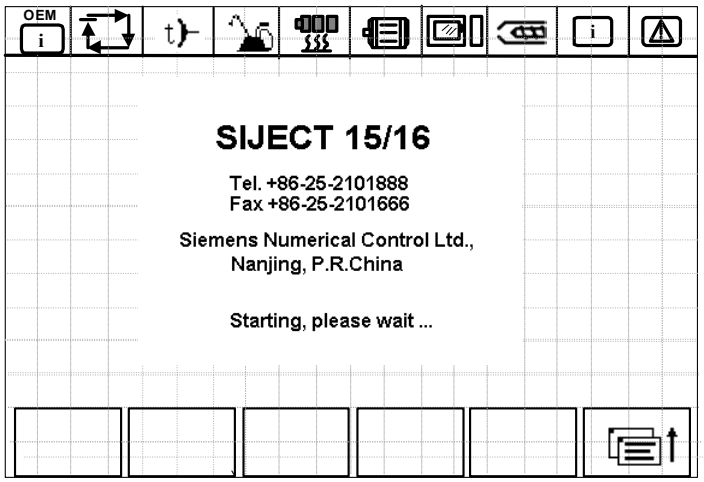


Fig. 3-2 Customer Specific Picture (CSP)

This picture is presented for 3 seconds. Siemens can make every specific picture according to the requirements of users.

Menu 2: Information screen 1

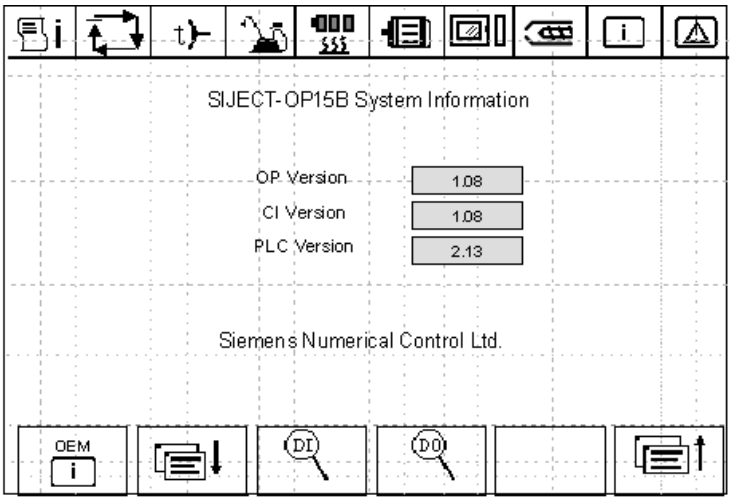


Fig 3-3 Information screen 1

This picture will last 3 seconds.

Menu 3: Monitoring screen

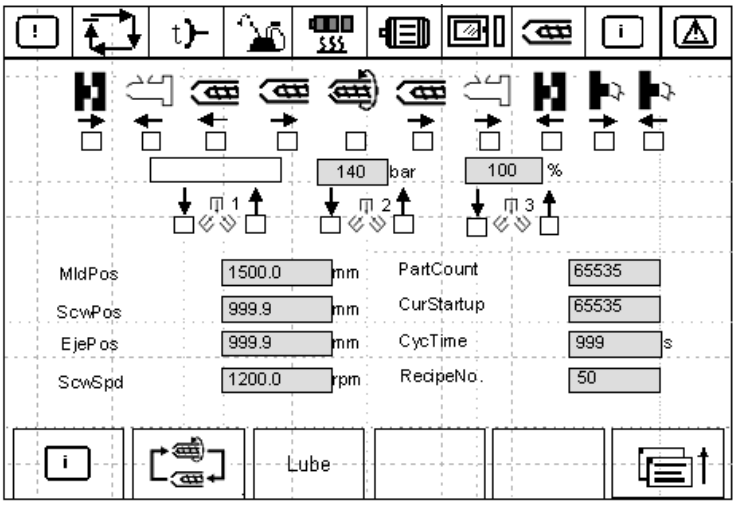


Fig.3-4 Monitoring screen

This screen is the main picture of the system. This screen will display all the time until it is switched to the desired menu by pressing the other keys.

The operator can supervise the production process with reference to the parameters displayed on the screen. The current operation state is displayed in the status field. In case of malfunction, the alarm symbol will appear and user can enter alarm picture to check the alarm.

3.2.2 Alarm

General

Up to 32 alarms can be displayed in SIJECT16. The active alarm will pop up on the Alarm screen.

Alarm list

You can see the alarm text and remedy in following table:

Table 3-3 Alarm list

[Name]	Description / Remedy
AdjLimit	Mold adjustment is over limit
	1. Check the limit switch 2. Readjust the mold
AutAdjFin	Auto-mold adjustment finished.
	1. Manual operation is permitted.
AdjSenErr	Photo-sensor for mold adjustment is invalid
	1. Photo-sensor is invalid in mold adjustment advance/retract. 2. Check if the photo-sensor is damaged.
TmpLimit	Temperature is not in permitted range.
	1. Check the heating status of barrel. 2. Check if the heating LED lights up.
OilTmp	Oil temperature is out of the range.
	1. Check the oil temperature. 2. Check the oil thermocouple.
MotLoad	Hydraulic pump is overload.
	1. Check the hydraulic system. 2. Check the circuit breaker.
MldSg	Safety door is not closed.
	1. Check the limit switch of safety door. 2. Close the safety door.
PartCount	Product counter is full.
	1. Enter a big value. 2. Set the part counter to zero.
TmCyc	Actual cycle time surpasses the setting.
	1. One step occupies too much time during the cycle. 2. Cycle time is too short.
CycSenCov	Cycle photo-sensor is covered.
	1. The photo-sensor is damaged. 2. The photo-sensor is covered by the workpiece.
CycSenErr	Cycle photo-sensor has error.
	1. The photo-sensor is damaged.
MldOpnErr	Mold can not open to end position.
	1. Check the limit switch. 2.Adjust the position/pressure/flow and tolerance.
TmMldLck	Mold can not be locked.
	1. Clear the obstacle in the mold. 2. Adjust pressure/flow.
EjeNotBck	Ejector is not in the back position.
	1. Check if the ejector is at end limit switch. 2. Check pressure/flow.
CorNotBck	Cores are not back to the start position.
	1. Check the limit switch for core in/out.

[Name]	Description / Remedy
TmCha	Charging is not finished.
	1. No material in hopper. 2. Check if the backpressure is too high.
TmMldPro	Low-pressure mold protection time is up.
	1. Clear the obstacle in the mold. 2. Extend the mold protection time.
InjSg	Injection safety door is not closed.
	1. Close the safety door when injection. 2. Check the switch of safety door.
LubeErr	Lubrication oil level is too low.
	1. Check the setting of lubrication.
Alarm 20	Waiting for robot.
	1. Waiting for robot downward.
RobErr	Robot is failed.
	1. Check the sensor of robot. 2. Check the setting of robot.
TcInj	Injection time has been exceeded.
	1. Check the material. 2. Check the nozzle.
ScwSenErr	Screw speed is abnormal.
	1. Check if there is any material in the barrel. 2.
LS PS Err	Power supply of linear scale is failure.
	1 2
TC1 Fault	Thermocouple of channel 1 (nozzle) is broken.
	1 2
TC2 Fault	Thermocouple of channel 2 (heater) is broken.
	1 2
TC3 Fault	Thermocouple of channel 3 (heater) is broken.
	1 2
TC4 Fault	Thermocouple of channel 4 (heater) is broken.
	1 2
TC5 Fault	Thermocouple of channel 5 (heater) is broken.
	1 2
TC6 Fault	Thermocouple of channel 6 (oil) is broken.
	1
	2
Alarm 31	
Alarm 32	

3.3 Checking I/Os

Overview

After booting without any error, the control system can be put into operation. Check I/Os status prior to setting the parameters, which can avoid the unnecessary troubleshooting.

Operating sequences

Press Information Key to enter information screen. Then press softkey F3 or F4 to check the actual status of digit input/output.

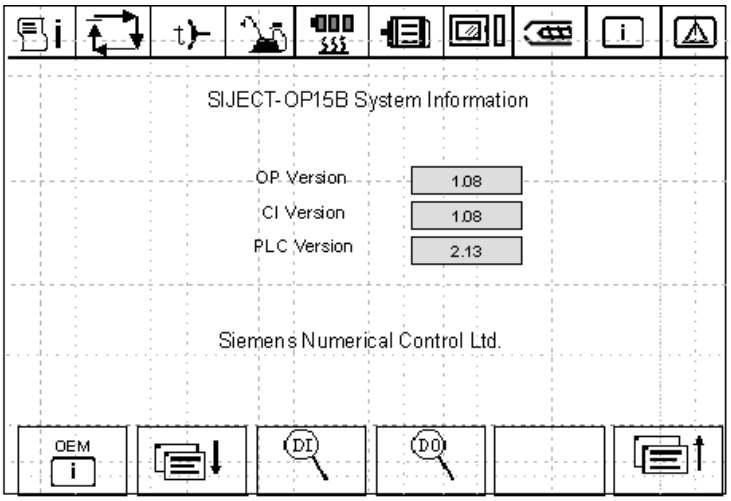


Fig. 3-5 Information Screen 1

Then, press softkey F3 to enter DI screen (digit input)：

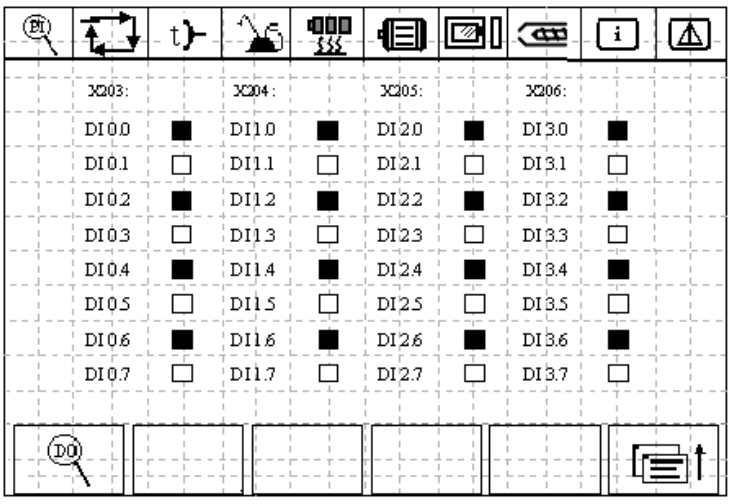


Fig. 3-6 Information screen 2 --- DI

Use current parameters to check the LED status.

Press different button in manual mode to observe the changing status.

On information screen 1 (Fig. 3-5 Information Screen 1), press softkey F4 to enter DO screen (digit output); or, on information screen 2 (Fig. 3-6 Information Screen 2 --- DI), press softkey F1 to enter DO screen.

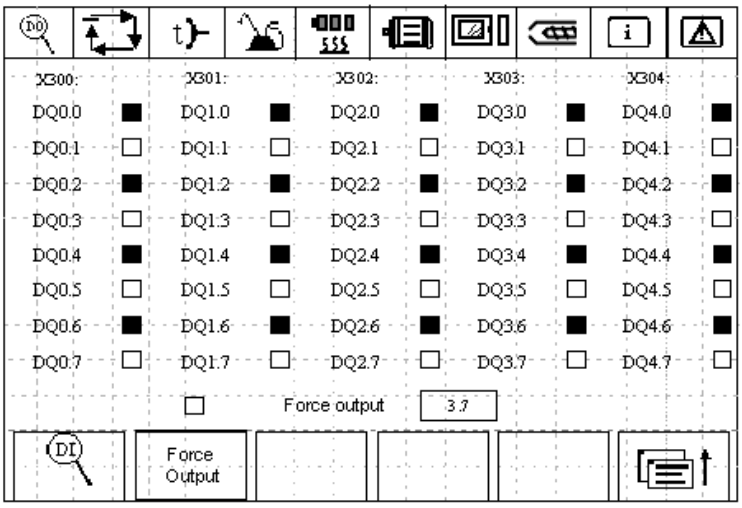


Fig. 3-7 Information Screen 3 --- DO

Use current parameters to check the LED status.

Press different button in manual mode to observe the changing status.

On Fig. 3-7 Information Screen 3 --- DO, “Force Output” is for the force output of certain point. For example, enter 3.4 and press F2 “Force Output”, then the box will backlight. At this moment, DQ3.4 is backlighting on the screen, and in the system this point will have output and LED lights up.

3.4 Setting important parameters

In this chapter, we will give a description of how OEMs set the most important parameters for injection molding machine. It contains how to select language and service, how to set each parameter, such as linear scale, password, saving mode, start-up of proportional valve, combination of pumps, lubrication, temperature and ramp.

Warning

Never pull out or plug in the connector while the equipment is live! Otherwise this can result in the damage of data loss or control failure.

Note

Password of level 2 (2000) must be entered prior to parameter setting! During operation, do not transfer the parameter!

3.4.1 Language selection

General

It is very important for operators to find the desired menus as soon as possible. As the first step you should select the appropriate language. You can select the language (Chinese/English) on this screen.

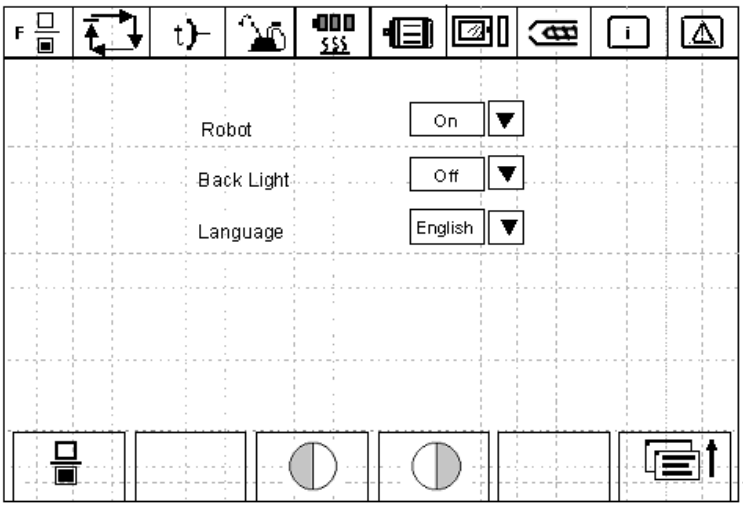


Fig. 3-8 Function Screen

Operating Sequences

Change language: first move the cursor to the third line, then press softkey F1 to choose Chinese or English, and confirm with Enter Key.

Fig. 3-8 Function Screen, language can be changed. Steps are as follows:

1. Press cursor key ▲ or ▼ to enter language selection box;
2. Press selection key ▣ (if it is the first entry, then input password of level one of 1111, then press Enter key to return to Function Screen);
3. The cursor moves to left, and choose by key ▲ or ▼ ;
4. Select Chinese or English;
5. Press Enter Key to confirm.

3.4.2 Service selection

General

Users can execute some basic setting and selections by this function.

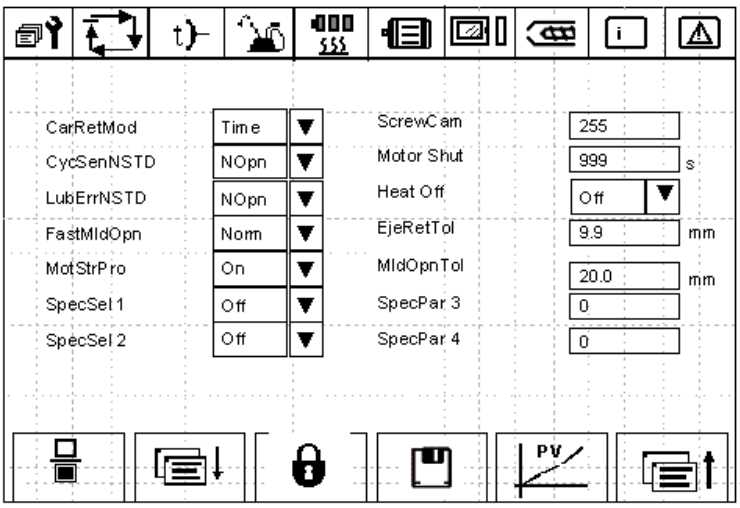


Fig. 3-9 Service Screen 1 --- service selection

Operating Sequences

Press Service Key to enter Service screen. See Fig. 3-9 Service Screen 1 --- service selection.

Carriage retract mode (CarRetMod) --- Carriage retract can select position mode or time mode.

Cycle sensor not standard (CycSenNSTD) --- Sensor can be set as Normal Open mode (Nopn) mode or Normal Close (NClo) mode.

Lubrication error not standard (LubErrNSTD) --- Switch contact in the alarm circuit can be set as Normal Open mode (Nopn) mode or Normal Close (NClo) mode.

Fast mold open (FastMldOpn) --- It can be set as Normal mode (fast mold open) and special mode (slow mold open).

Motor protection (MotStrPro) --- Motor protection can be selected, i.e., whether to extend time during the start-up of star triangle. Motor protection also can be deselected.

Special selection 1 (SpecSel 1) --- Spare.

Special selection 2 (SpecSel 2) --- Spare.

Screw cam number (ScrewCam) --- During screw speed measurement, cam numbers set on the screw. Range: 1~ 255.

Motor shut --- When there is alarm, it is the time passing by from alarm occurring to motor shut. Range: 30~999.

Heat Off --- When alarm occurs, user selects whether to switch off the heater.

Ejector retract tolerance (EjeRetTol) --- When ejector selects linear scale, the tolerance of ejector retract can be set from 0.1~9.9 mm.

Mold open tolerance (MldOpnTol) --- The tolerance of mold open can be set from 1.0～99.9.

Special parameter 3 (SpecPar 3) --- Spare.

Special parameter 4 (SpecPar 4) --- Spare.

Operation Example

To select position in carriage retract mode, you can do as follows:

1. Press cursor key or to enter CarRetMod selection;
2. Press selection key , and the cursor moves to left;
3. Press cursor key or to select “Pos”;
4. Confirm by Enter key.

3.4.3 Setting linear scale

General

Users can select two linear scales or three linear scales, and set reference point and length.

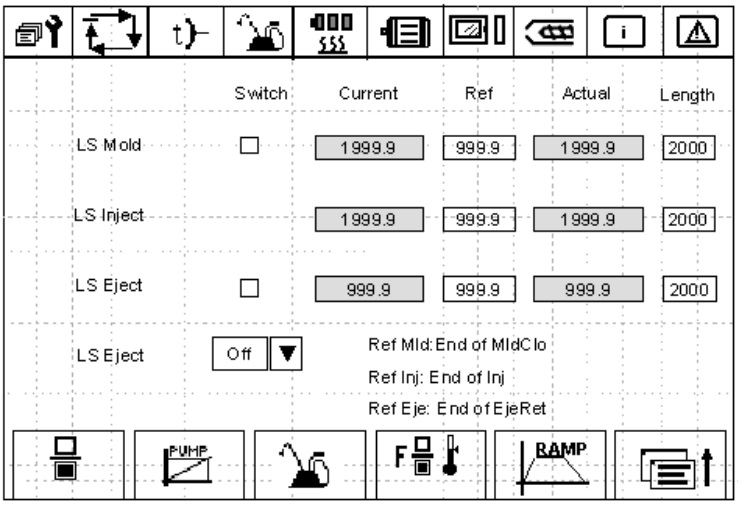


Fig. 3-10 Service Screen 2 --- setting linear scale

Operating sequences

Press softkey F2 to enter the next screen. See Fig. 3-10 Service screen 2 --- linear scale.

Linear Scale mold:

Switch --- Proximity switch signal. When mold close is at position, the box will backlight, showing the reference point of linear scale.

Reference point --- setting value. Mold lock end should be the reference of linear scale.

Length --- setting value. The length of linear scale can be set here, ranged from 1～6553mm.

Actual value --- displayed value. Display the actual value of linear scale.

Current value --- displayed value. It is the difference from actual value to reference point.

Linear scale injection:

Reference point --- setting value. Reference point of linear scale can be set here.

Length --- setting value. The length of linear scale can be set here, ranged from 1～6553mm.

Actual value --- displayed value. Display the actual value of linear scale.

Current value --- displayed value. It is the difference from actual value to reference point.

Linear scale ejector:

Switch --- Proximity switch signal. When ejector retract is at position, the box will backlight, showing the reference point of linear scale.

Reference point --- setting value. Ejector retract end should be the reference of linear scale.

Length --- setting value. The length of linear scale can be set here, ranged from 1～6553mm.

Actual value --- displayed value. Display the actual value of linear scale.

Current value --- displayed value. It is the difference from actual value to reference point.

Linear scale ejector --- Linear scale ejector can be selected or deselected here.

3.4.4 Setting Password

General

The password has three levels. Password level 1 for factory setting is 1111, level 2 is 2000, and refer to manufacturer for password of highest level.

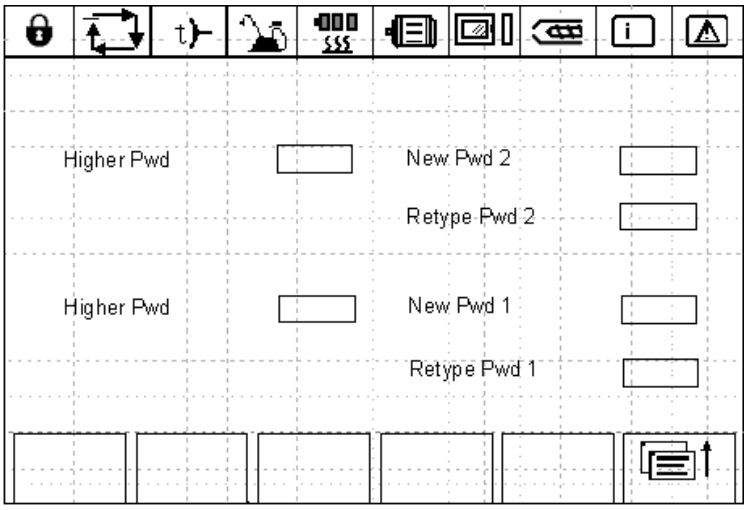


Fig. 3-11 Service Screen 1.1 --- password setting

Operating sequences

Press softkey F3 to enter password setting screen. See Fig. 3-11 Information screen 1.1 --- password setting, password can be set and changed on this screen.

Upper:

Higher password --- the highest level. The default value of this system is xxxx (Please ask manufacturer), then confirm by Enter Key.

New Password 2 --- A new password 2 can be set here, then confirm by Enter Key. The default value of this system is 2000.

Retype Password 2 --- retype the new password 2, and confirm it with Enter Key.

When the password has been successfully changed, the screen will display a message. Press Acknowledgment Key to finish the operation.

Lower:

Higher password --- it is the password level 2. The default value of this system is 2000, then confirm by Enter Key.

New password 1 --- a new password 1 can be set here, then confirm by Enter Key. The default value of this system is 1111.

Retype password 1 --- retype the new set password 1, then confirm it by Enter Key.

When the password has been successfully changed, the screen will display a message. Press Acknowledgment Key

to finish the operation.

3.4.5 Save/load setting

General

Users can save/load the PLC, menus and CSP (customer specific picture) by this function. It can save/load information to/from MMC.

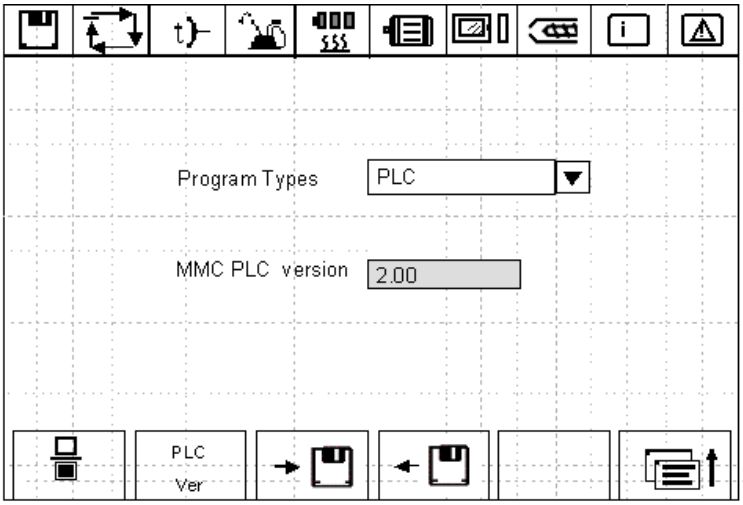


Fig. 3-12 Service Screen 1.2 --- save/load setting

Operating sequences

Press softkey F4 to enter save/load screen. The PLC/menus/CSP can be saved/loaded to/from MMC.

Program types --- User can select PLC, menus or CSP.

MMC PLC version --- displayed value. Press softkey F2 “PLC version” to show the PLC version in MMC.

Operating examples

To select Menus in Program types. Steps are as follows:

1. Press cursor key or to enter program type selection;
2. Press Selection Key , and the cursor moves to the left;
3. Press cursor key or to select “Menus”;
4. Press Enter Key to confirm.

Download Menus from MMC. Steps are as follows:

1. Plug in MMC card in the CI;
2. Select “Menus” in Program Type;
3. Press softkey F4 to start data transfer;
4. Restart the system after the transfer process is finished. The operation is over.

3.4.6 Proportional valve adjustment

General

Users can adjust the proportional valve and test it.

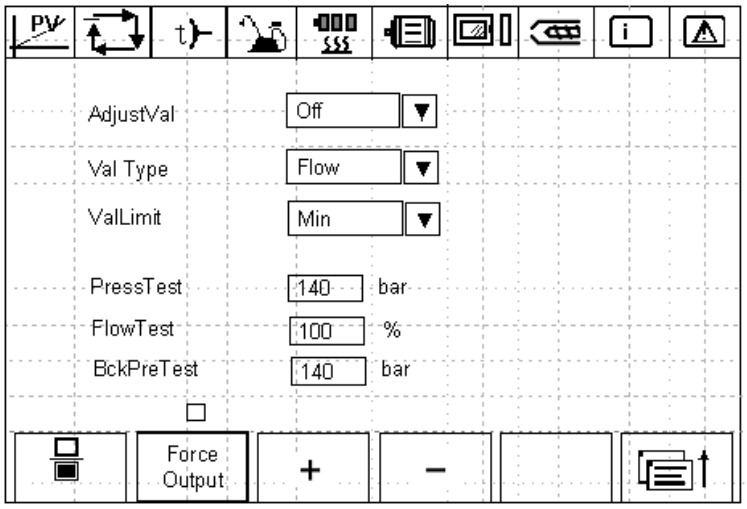


Fig. 3-13 Service Screen 1.3 --- proportional valve adjustment

Operating sequences

Press softkey F5 to enter proportional valve adjustment screen. See Fig. 3-13 Service Screen 1.3 --- proportional valve adjustment. Proportional valve can be adjusted here, and you can test pressure, flow and backpressure under force output mode.

Adjust Valve --- select On/Off to start valve adjustment.

Valve Type --- select the type of valve: flow / pressure / back-pressure / reserved.

Valve Limit --- select min. / max. value.

Pressure Test --- in force output mode, input pressure value, ranged from 0～140bar.

Flow Test --- in force output mode, input flow value, ranged from 0～100%.

BackPressure Test --- in force output mode, input pressure value, ranged from 0～140bar.

Operating sequences

Firstly, start valve adjustment:

Select “ON” in Adjust Valve mode:

1. Use cursor key ▲ or ▼ to enter valve adjustment selection;
2. Press selection key , and the cursor moves to the left;
3. Use cursor key ▲ or ▼ to select “ON”;
4. Press Enter key to confirm.

Secondly, select valve type, such as pressure valve; then select valve limit, such as maximum:

Choose “Max.” in valve limit, and change its value by softkey:

1. Use cursor key or to enter valve adjustment selection;

2. Press selection key , and cursor moves to left;

3. Use cursor key or to select “Max.”;

4. Confirm it with Enter Key;

5. Press softkey F3 “+” to increase the “Max.”; or use softkey F4“-” to reduce “Max.”. This process can be observed by external amperemeter.

Lastly, check the adjustment result:

In the “Force Output” mode, implement the “Pressure Test”:

1. Press softkey F2 “Force Output”, and the upper box will backlight;

2. Set the value of 140bar in Pressure Test;

3. Check if the external amperemeter reaches the maximum, such as 1Amp.

Caution

The handling with the Proportional valve is subject to the prerequisites that all the electrical wiring is completed and the power supply DC 24V / DC 38V is connected.

We describe the commisioning process as an example provided that the resistance of the proportional valve is 10Ω and DC24V power supply is adopted. Therefore, it means that the max.output value of PV is reached when the pointer in the amperemeter indicates the maximal value of 1A, and the min. output value is reached when the pointer indicating 100mA (proportional flow valve) and 0 mA (proportional pressure valve).

3.4.7 Pump Combination Setting

General

User can set the pump combination according to different machine type, so as to optimize the energy.

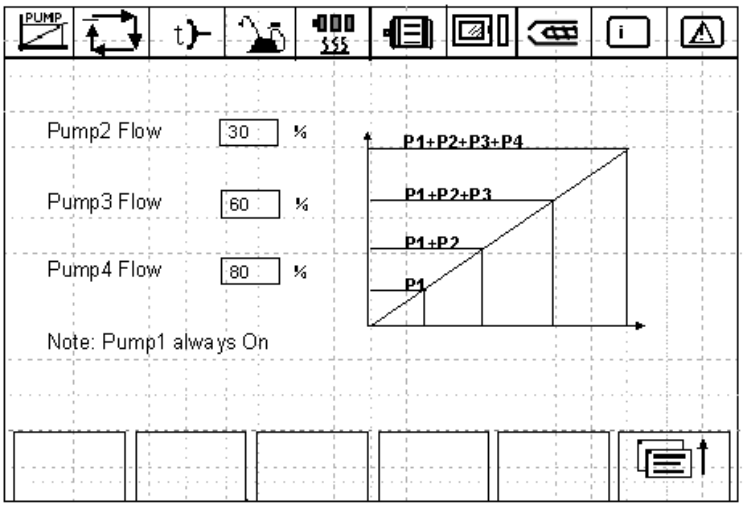


Fig. 3-14 Service Screen 2.1 --- pump combination setting

Operating sequences

On service screen 1, press softkey F2 to enter service screen 2 --- linear scale setting. Then, press softkey F2 PUMP to enter pump combination setting screen. See Fig. 3-14 Service Screen --- pump combination setting. Pump2/pump3/pump4 can be selected here and the flow can be set accordingly.

Pump2 Flow --- flow range 0～100%

Pump3 Flow --- flow range 0～100%

Pump4 Flow --- flow range 0～100%

3.4.8 Lubrication setting

General

User can set the time and interval of lubrication.

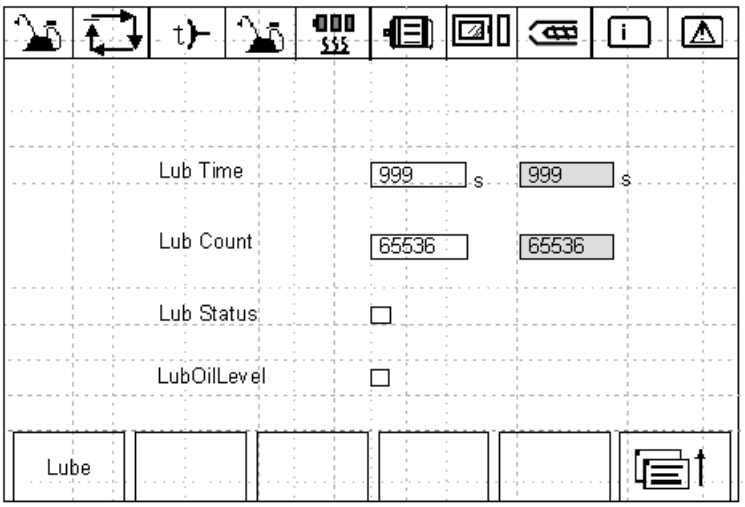


Fig. 3-15 Service Screen 2.2 --- lubrication picture

Operating sequences

On service screen 1, press softkey F2 to enter service screen 2 --- linear scale setting. Then press softkey F3 to enter lubrication setting screen. See Fig. 3-15 Service Screen 2.2 --- lubrication picture. Lubrication time and lubrication count can be set here.

Lubrication Time --- every lubrication time can be set here, ranged from 0.0~99.9sec.

Lubrication Count --- set one cycle here and the system will be lubricated automatically. The range is from 1 to 9999.

Lubrication Status --- Press softkey F1 “manual lubrication” to start the lubrication, then the box will backlight, and is flashing.

Lubrication Oil Level --- Inform the user to add lubrication oil when the oil level is very low, then the box will backlight and alarm occurs, i.e., is flashing.

3.4.9 Temperature setting

General

User can set temperature channel and temperature tolerance.

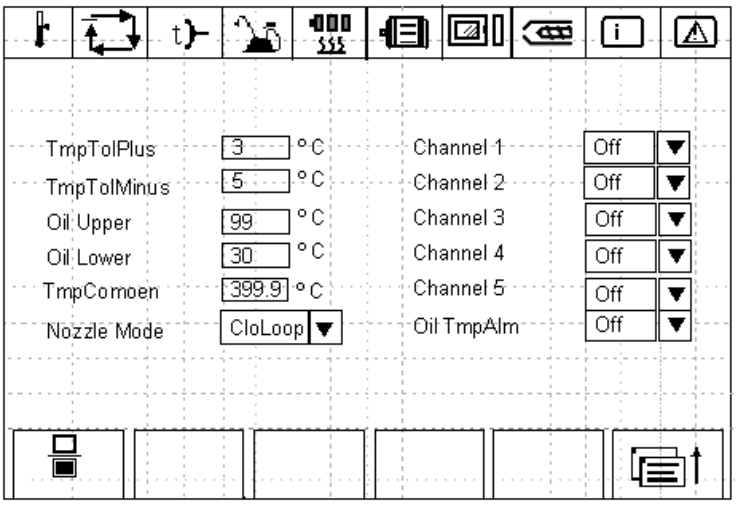


Fig. 3-16 Service Screen 2.3 --- Temperature setting

Operating sequences

On service screen 1, press softkey F2 to enter service screen 2 --- linear scale setting. Then, press softkey F4 so as to enter temperature setting screen. Temperature channel can be set from 1 to 5, and temperature can be set accordingly.

Temperature Tolerance Plus --- set the tolerance plus for each temperature channel.

Temperature Tolerance Minus --- set the tolerance minus for each temperature channel.

Oil Upper --- set the upper limit of hydraulic oil temperature.

Oil Lower --- set the lower limit of hydraulic oil temperature.

Temperature Compensation --- set the temperature compensation. The system has been set compensation before delivery, and it is unnecessary for users to set it.

Nozzle Mode --- two modes are available, it can be assigned as close-loop or open-loop.

Channel 1 --- select or deselect

Channel 2 --- select or deselect

Channel 3 --- select or deselect

Channel 4 --- select or deselect

Channel 5 --- select or deselect

Oil Temperature Alarm --- If oil temperature alarm is selected: when the upper/lower limit of oil temperature has been set, there is no alarm if oil temperature is within the specification and alarm occurs if it is out of specification.

Note
The default type of the thermocouples is K unless otherwise programmed in the PLC application.

Normally the themperature compensation is intended only for the controller manufacturer to calibrate the offset of the electronic measurement device on the controller and every SIJECT is delivered in a compensated state. In case it should be necessary to re-compensate the thermocouple, i.e., the displayed temperature is different from the actual temperature value, please perform the following steps:

1. Measure the outside temperature with a thermometer before starting the heater;
2. Type in the outside temperature value;
3. Check the heater temperature on Temperature Screen 1/2. The displayed value must be exactly the measured outside temperature.

Caution

The thermocouple input is scanned every 100ms at intervals and the displayed temperature values on the screen will be refreshed every 800ms for all 8 thermocouple inputs.

The broken wire detection is done every 40 seconds at intervals. It makes a clicking sound at the same time.

3.4.10 Setting the Ramp data

General

All the ramp data are assigned in order to moderate the running shake of the machine during the movement switch, so that the product service life can be extended.

Users should observe the machine movement diversification when adjusting the setting data and optimizing the parameters, until the machine can run smoothly.

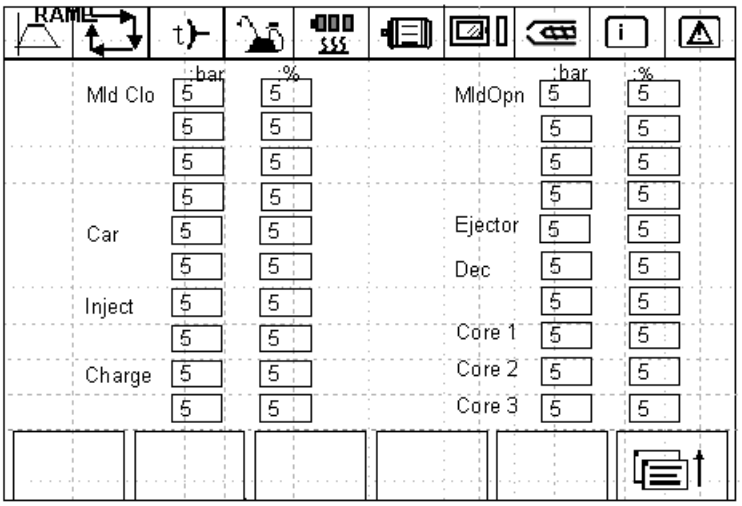


Fig 3-17 Service Screen 2.4 --- setting ramp data

Operating Sequences

On service screen 1, press softkey F2 to enter service screen 2 --- linear scale setting. Then, press softkey F5 RAMP to enter ramp setting screen. See Fig. 3-17 Service Screen 2.4 --- setting ramp data. The ramp data for every movement can be set accordingly.

Mold Close --- there are four ramps to be set: pressure and flow for each ramp, and ranged from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Carriage --- it refers to the ramps during carriage advance and carriage retract: set pressure and flow for each, and ranged from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Inject --- it refers to the ramps when injection starts and injection completes: set pressure and flow for each, and the range is from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Charge --- it refers to the ramps when charging starts and charging completes: set pressure and flow for each, and the range is from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Mold Open --- there are four ramps to be set: pressure and flow for each ramp, and ranged from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Ejector --- it is the ramp before and after the actions of ejector: set pressure and flow for each, and the range is from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

Decompression --- they are the ramps when decompression begins and decompression completes: set pressure and flow for each, and the range is from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch:

Core 1 --- it is the ramp for core 1 in/out: set pressure and flow for each, and the range is from 0 to 99. The values should be the differences for pressure and flow between every two PLC cycles when there is action switch.

3.5 Up-/download PLC program

General

The highlight of SIJECT15/16 consists in that the PLC program can be up-/downloaded whenever you wish. You can modify the program in your PC/PG after you come into the programming environment.

SIJECT Project Tool is a complete PLC programming environment for system development.

SIMATIC Manager: is the basic programming and configuration software for SIMATIC. It is made up of a series of applications intended to create and test user program.

Preconditions

To up-/download the PLC program you need the following:

— A PC/PG with RS232 interface;

— RS232 adapter and a specific cable (for SIJECT15) / MPI adapter and an appropriate cable (for SIJECT16);

— A CD with SIJECT Project Tool (for SIJECT15) / SIMATIC S7-300 programming tool in CD (SIJECT16);

— MMC card.

The **Mode Selector S1** must be set in **RUN_P** position prior to up-/downloading PLC program!

Note

The MMC card can be used to save/load the PLC program. Carry out external data saving before you up-/download the program. See 3.1.4 “recipe data saving”.

Up-/Download

Procedure

PLC program can only be uploaded/downloaded after SIJECT Project Tool (for SIJECT15) or SIMATIC Manager (for SIJECT16) has been ordered.

Step 1: Up-/download PLC program in SIJECT15:

1. Start SIJECT Project Tool in PC/PG;
2. Open Project;
3. Locate the mouse pointer at the symbol **Online** in the menu bar and click the mouse;
4. Select the menu command **Communication parameter**;
5. Check following parameters:

Port	COM1
Baudrate	19200
Parity	Even
Stop bits	1
Motorola byteorder	No

6. Locate the mouse to **Online** again;
7. Select menu command **Login**;

8. The screen will display following information:

   “The program has been changed. Do you want to download new program --- Yes or No?”

9. Select “Yes” and click the mouse to download the new program;
10. Put the mouse pointer to **Online** for the third time;
11. Select menu command **Create boot project**;
12. Display following information:

    “Yes, No or Abort?”

13. Select “Yes”, then the program will be saved in EEPROM.

Now the PLC downloading process is finished.

Caution

Uploading can not be implemented in SIJECT15. Therefore, PLC applications must be saved in disk, and then modified in PC/PG.

Step 2: Up-/download PLC program in SIJECT16:

1. Start the SIMATIC Manager in PC/PG;
2. Locate the mouse pointer at the symbol **PLC** in the menu bar and click the mouse;
3. Select the menu command **Upload**;
4. Press on the symbol and then release.

Now the Uploading process is finished.

Or

1. Start the SIMATIC Manager in PC/PG;
2. Locate the mouse pointer at the symbol **PLC** in the menu bar and click the mouse;
3. Select the menu command **Download**;
4. Press on the symbol **Download** and then release.

Now the Downloading process is finished.

4 Programming Tool

Contents

Section	Heading	Page
4.1	SIJECT Project Tool	4-2
4.1.1	Introduction	4-2
4.1.2	Data types	4-4
4.1.3	Operators	4-6
4.1.4	Standard Library Elements	4-14
4.1.5	Operands	4-17
4.2	SIMATIC Manager	4-19

Purpose

This chapter describes the following process:

- SIJECT Project Tool: basic subject for programming in SIJECT15
- SIMATIC Manager: a brief introduction for programming in SIJECT16

4.1 SIJECT Project Tool

General

SIJECT Project Tool is a complete development environment for your PLC(SIJECT Project Tool stands for Controller Development System).

SIJECT Project Tool puts a simple approach to the powerful IEC language at the disposal of the PLC programmer. Use of the editors and debugging functions is based upon the proven development program environments of advanced programming languages (such as Visual C++).

4.1.1 Introduction

Preliminary

SIJECT Project Tool is a complete development tool used to program your PLC which will save you a measurable amount of time setting up your applications.

Project components

A project contains all of the objects in a PLC program. A project is saved in a file named after the project. The following objects are included in a project: POUs(Program Organization Units), data types, visualizations, resources, and libraries.

You have to follow the most important concepts mentioned above in order to make starting easier:

- **POUs:**
  Functions, function blocks and programs are POUs.
- **Data types:**
  Along with the standard data types the user can define his own data types. Structures, enumeration types and references can be created.
- **Visualization:**
  SIJECT Project Tool provides visualizations so that you can display your project variables. You can plot geometric elements off-line with the help of the visualization. They can then change their form online, depending upon certain variable values.
- **Resources:**
  You need the resources for configuring and organizing your project and for tracing variable values: Global Variables, PLC Configuration, Task Configuration, Sampling Trace, Watch and Receipt Manager.
- **Libraries:**
  You can include in your project a series of libraries whose POUs, data types and global variables you can use just like user-defined variables. The library “standard.lib” is a standard part of the program and is always at your disposal.

Programming Languages

POU consists of a declaration part and a body. The body is written in one of the IEC programming languages which include IL, ST, SFC, FBD and LD.

The programming languages are comprehended as follows:

- **Instruction List (IL):**
  An instruction list (IL) consists of a series of instructions. Each instruction begins in a new line and contains an operator and

depending on the type of operation, one or more operands separated by commas.

— **Structured Text (ST):**
The structured text consists of a series of instructions which, as determined in high level languages or in loops can be executed.

— **Sequential Function Chart (SFC):**
The Sequential Function Chart is a graphically oriented language which makes it possible to describe the chronological order of different actions within a program.

— **Function Block Diagram (FBD):**
The Function Block Diagram is a graphically oriented programming language. It works with a list of networks whereby each network contains a structure which represents either a logical or arithmetic expression, the call of function block, a jump or a return instruction.

— **Ladder Diagram (LD):**
The Ladder Diagram is also a graphics oriented programming language which approaches the structure of an electric circuit.

Standard

The standard IEC 1131-3 is an international standard for programming languages of Programmable Logic Controllers.

Main window

The following elements are found in the main window of SIJECT Project Tool (from top to bottom, see Fig. 4-1):

— The **menu bar**

— The **Tool bar** (optional); with buttons for faster selection of menu commands

— The **Object Organizer** with register cards for POUs, Data types, Visualizations and Resources

— A vertical **screen divider** between the Object Organizer and the Work space of SIJECT Project Tool

— The **Work space** in which the editor windows are located

— The **message window** (optional)

— The **Status bar** (optional); with information about the current status of the project

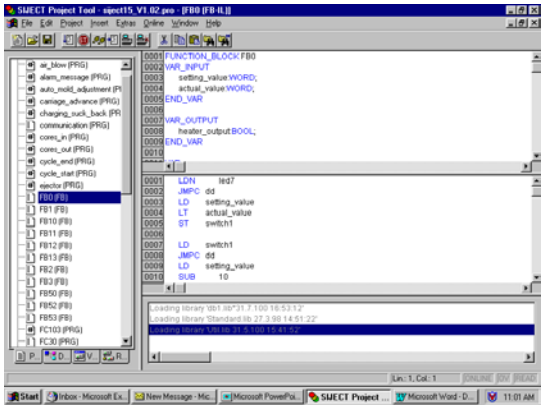


Fig. 4-1 Main window of SIJECT Project Tool

4.1.2 Data types

General

You can use standard data types and user-defined data types when programming. Each identifier is assigned to a data type which dictates how much memory space will be reserved and what type of values it stores.

Standard data types

It contains the following data:

- **Bool:** TRUE and FALSE, 8 bits
- **Integer Data Types:**

BYTE	0~255, 8bits
WORD	0~65535, 16bits
DWORD	0~4294967295, 32bits
SINT	-128~127, 8bits
USINT	0~255, 8bit
INT	-32768~32767, 16bits
UINT	0~65535, 16bits
DINT	-2147483648~2147483647
UDINT	0~4294967295, 32bits

- **REAL/LREAL:** floating-point types, REAL 32bits, LREAL 64bits
- **STRING:** can contain any string of characters, default size 80 characters
- **Time data types:**

TIME	millisecond, 32bits
TIME_OF_DAY	millisecond, 32bits
DATE	second, 32bits
DATE_AND_TIME	second, 32bits

Defined Data types

It contains the following data:

- **ARRAY:**
  One-, two-, and three-dimensional fields (arrays) are supported as elementary data types. Arrays can be defined both in the declaration part of a POU and in the global variable lists.

  Syntax:
  <Field_Name>:ARRAY[<111>..<u11>,<112>..<u12>]OF<elem.Type>

  Example:
  Card_game: ARRAY[1..13, 1..4] OF INT

- **Pointer:**
  Variable or function block addresses are saved in pointers while a program is running.

  Syntax:
  <Identifier>: POINTER TO <Datatype/Functionblock>

  Example:
  pt:POINTER TO INT;
  var_int1:INT:=5
  var_int2:INT;
  pt:=ADR(var_int1);
  var_int2:=pt^;(*var_int2 is now5*)

— **Enumeration:**
Enumeration is a user-defined data type that is made up of a number of string constants.

Syntax:
TYPE<Identifier>:<Enum_0>,<Enum_1>,…,<Enum_n>);
END_TYPE

Example:
TYPE TRAFFIC_SIGNAL: (Red, Yellow, Green:=10); (*The initial value for each of the colors is red 0, yellow 1, green 10*)
END_TYPE

— **Structures:**
Structures are created as objects in the Object Organizer under the register card.

Syntax:
TYPE<Structurename>:
STRUCT
  <Declaration of Variables1>
  .
  .
END_STRUCT
END_TYPE

Example:
TYPE Polygonline:
STRUCT
  Start: ARRAY [1..2] OF INT;
  Point1: ARRAY [1..2] OF INT;
  Point2: ARRAY [1..2] OF INT;
  Point3: ARRAY [1..2] OF INT;
  Point4: ARRAY [1..2] OF INT;
  End: ARRAY [1..2] OF INT;
END_STRUCT
END_TYPE

— **References:**
You can use the user-defined reference data type to create an alternative name for a variable, constant or function block.

Syntax:
TYPE <Identifier>:<Assignment term>;
END_TYPE

Example:
TYPE message: STRING[50];
END_TYPE;

4.1.3 Operators

IEC Operators

SIJECT Project Tool supports all IEC Operators. In contrast with the standard functions, these operators are recognized implicitly throughout the project. Operators are used like functions in POU implemented Arithmetic Operators.

— **ADD:**
Addition of variables of the types: BYTE, WORD, DWORD, SINT, USINT, INT, UINT, DINT, UDINT, REAL and LREAL.

Example in IL:
```
LD      7
ADD     2,4,7
ST      Var 1
```

— **MUL:**
Multiplication of variables of the types: BYTE, WORD, DWORD, SINT, USINT, INT, UINT, DINT, UDINT, REAL and LREAL.

Example in IL:
```
LD      7
MUL     2,4,7
ST      Var 1
```

— **SUB:**
Subtraction of one variable from another of the types: BYTE, WORD, DWORD, SINT, USINT, INT, UINT, DINT, UDINT, REAL and LREAL.

Example in IL:
```
LD      7
SUB     2,4,7
ST      Var 1
```

— **DIV:**
Division of one variable by another of the types: BYTE, WORD, DWORD, SINT, USINT, INT, UINT, DINT, UDINT, REAL and LREAL.

Example in IL:
```
LD      8
DIV     2
ST      Var 1    (*Result is 4*)
```

— **MOD:**
Modulo Division of one variable by another of the types: BYTE, WORD, DWORD, SINT, USINT, INT, UINT, DINT, UDINT, REAL and LREAL. The result of this function will be the remainder of the division. This result will be a whole number.

Example in IL:
```
LD      9
MOD     2
ST      Var 1    (*Result is 1*)
```

— **INDEXOF:**
Perform this function to find the internal index for a POU.

Example in ST:
```
var1:=INDEXOF(POU2)
```

— **SIZEOF:**
Perform this function to determine the number of bytes required by the given data type.

Example in IL:
```
arr1:ARRAY[0..4] of INT;
Var1    INT
LD      arr1
SIZEOF
ST      Var1    (*Result is 10*)
```

Bitstring Operators

— **AND:**
Bitwise AND of bit operands. The operands should be of the type BOOL, BYTE, WORD or DWORD.

Example in IL:
```
Var1    BYTE
LD      2#1001_0011
AND     2#1000_1010
ST      Var1    (*Result is 2#1000_0010*)
```

— **OR:**
Bitwise OR of bit operands. The operands should be of the type BOOL, BYTE, WORD or DWORD.

Example in IL:
```
Var1    BYTE
LD      2#1001_0011
OR      2#1000_1010
ST      Var1    (*Result is 2#1000_1011*)
```

— **XOR:**
Bitwise XOR of bit operands. The operands should be of the type BOOL, BYTE, WORD or DWORD.

Example in IL:
```
Var1    BYTE
LD      2#1001_0011
OR      2#1000_1010
ST      Var1    (*Result is 2#0001_1001*)
```

— **NOT:**
Bitwise NOT of bit operands. The operands should be of the type BOOL, BYTE, WORD or DWORD.

Example in IL:
```
Var1    BYTE
LD      2#1001_0011
NOT
ST      Var1    (*Result is 2#0110_1100*)
```

Bit-Shift Operators

— **SHL:**
Bitwise left-shift of an operand: erg:=SHL(in, n)
The input variables erg, in and n should be of the type BYTE, WORD, or DWORD. in will be shifted to the left by n bits and filled with zeros on the right.

Example in IL:
```
LD      16#45
SHL     2
ST      erg_byte
```

— **SHR:**
Bitwise right-shift of an operand: erg:=SHR(in, n)
erg, in and n should be of the type BYTE, WORD, or DWORD. in will be shifted to the right by n bits and filled with zeros on the left.

Example in IL:
```
LD      16#45
SHR     2
ST      erg_byte
```

— **ROL:**
Bitwise rotation of an operand to the left: erg:=ROL(in, n)
erg, in and n should be of the type BYTE, WORD, or DWORD. in will be shifted one bit position to the left n times while the bit that is furthest to the left will be reinserted from the right.

Example in IL:
```
LD      16#45
ROL     2
ST      erg_byte
```

— **ROR:**
Bitwise rotation of an operand to the right: erg:=ROR(in, n)
erg, in and n should be of the type BYTE, WORD, or DWORD. in will be shifted one bit position to the right n times while the bit that is furthest to the left will be reinserted from the left.

Example in IL:
```
LD      16#45
ROR     2
ST      erg_byte
```

Selection Operators

All selection operations can also be performed with variables. For purposes of clarity we will limit our examples to the following which use constants as operators.

— **SEL:**
Binary Selection.
OUT:=SEL(G, IN0, IN1) means:
OUT:=IN0 if G=FALSE;
OUT:=IN1 if G=TRUE.

Example in IL:
```
LD      FALSE
SEL     3,4
ST      Var1    (*Result is 3*)
```

— **MAX:**
Maximum function. Returns the greater of the two values.
OUT:=MAX(IN0, IN1)

Example in IL:
```
LD      90
MAX     30
MAX     40
MAX     77
ST      Var1    (*Result is 90*)
```

— **MIN:**
Minimum function. Returns the lesser of the two values.
OUT:=MIN(IN0, IN1)

Example in IL:
```
LD      90
MIN     30
```

```
MIN     40
MIN     77
ST      Var1    (*Result is 30*)
```

— **LIMIT:**
Limiting
OUT:=LIMIT(Min, IN, Max) means:
OUT:=MIN(MAX(IN,Min),Max)

Example in IL:

```
LD      90
LIMIT   30,80
ST      Var1    (*Result is 80*)
```

— **MUX:**
Multiplexer
OUT:=MUX(K,IN0,…,INn) means:
OUT:=INK

Example in IL:

```
LD      0
MUX     30,40,50,60,70,80
ST      Var1    (*Result is 30*)
```

Comparison Operators

— **GT:**
Greater than

Example in IL:

```
LD      20
GT      30
ST      Var 1   (*Result is FALSE*)
```

— **LT:**
Less than

Example in IL:

```
LD      20
LT      30
ST      Var 1   (*Result is TRUE*)
```

— **LE:**
Less than or equal to

Example in IL:

```
LD      20
LE      30
ST      Var 1   (*Result is TRUE*)
```

— **GE:**
Greater than or equal to

Example in IL:

```
LD      60
GE      40
ST      Var 1   (*Result is TRUE*)
```

— **EQ:**
Equal to

Example in IL:

```
LD      40
EQ      40
ST      Var 1   (*Result is TRUE*)
```

— **NE:**
Not equal to

Example in IL:
```
LD      40
NE      40
ST      Var 1   (*Result is FALSE*)
```

Address Operators

— **ADR:**
Address Function

Example in IL:
```
LD      Var1
ADR
ST      Var2
man_fun1
```

— **Content Operator:**
A pointer can be dereferenced by adding the content operator "^" after the pointer identifier.

Example in ST:
```
pt:POINTER TO INT;
var_int1:INT;
var_int2:INT;
pt:=ADR(var_int1);
var_int2:=pt^
```

Calling Operator

— **CAL:**
Calling a function block or a program

Example: Calling up the instance Inst from a function block where input variables Par1 and Par2 are 0 and TRUE respectively.
```
CAL INST(PAR1:=0, PAR2:=TRUE)
```

Type Conversion Functions

It is forbidden to implicitly convert from a "larger" type to a "smaller" type (for example from INT to BYTE or from DINT to WORD). Special type conversions are required if one wants to do this. One can basically convert from any elementary type to any other elementary type.

Syntax:
<elem.Typ1>_TO_<elem.Typ2>

— **BOOL_TO Conversions:**
Conversion from type BOOL to any other type.

Example in IL:
```
LD      TRUE   (*Result is 1*)
BOOL_TO_INT
ST      I
```

— **TO_BOOL Conversions:**
Conversion from another variable type to BOOL.

Example in IL:
```
LD      213     (*Result is TRUE*)
BYTE_TO_BOOL
ST      b
```

— **Conversion between Integral Number Types:**
Conversion from an integral number type to another number type.

Example in IL:
```
LD          2
INT_TO_REAL
MUL         3.5
```

— **REAL_TO-/LREAL_TO Conversions:**
Conversion from the variable type REAL or LREAL to a different type.

Example in IL:
```
LD          2.7
REAL_TO_INT
GE          %MW8
```

— **TIME_TO/TIME_OF_DAY Conversions:**
Conversion from the variable type TIME or TIME_OF_DAY to a different type.

Example in IL:
```
LD          T#12ms          (*Result is 'T#12ms'*)
    TIME_TO_STRING
ST          str
```

— **DATE_TO/DT_TO Conversions:**
Conversion from the variable type DATE or DATE_AND_TIME to a different type.

Example in ST:
```
b:=DATE_TO_BOOL(D#1970-01-01);          (*Result is FALSE*)
```

— **STRING_TO Conversions:**
Conversion from the variable type STRING to a different type.

Example in ST:
```
b:=STRING_TO_BOOL('TRUE');      (*Result is TRUE*)
```

— **TRUNC:**
Conversion from REAL TO INT. The whole number portion of the value will be used.

Example in IL:
```
LD          2.7
TRUNC
GE          %MW8
```

Numeric Functions

— **ABS:**
Returns the absolute value of a number. ABS(-2) equals 2.

Example in IL:
```
LD          2
ABS
ST          I       (*Result is 2*)
```

— **SQRT:**
Returns the square root of a number.

Example in IL:
```
LD          16
SQRT
ST          q       (*Result is 4*)
```

— **LN:**
Returns the natural logarithm of a number.

```
Example in IL:
LD      45
LN
ST      q       (*Result is 3.80666*)
```

— **LOG:**
Returns the logarithm of a number in base 10.

```
Example in IL:
LD      314.5
LOG
ST      q       (*Result is 2.49762*)
```

— **EXP:**
Returns the exponential function.

```
Example in IL:
LD      2
EXP
ST      q       (*Result is 9.7448e+009*)
```

— **COS:**
Returns the cosine of number. The value is calculated in arch minutes.

```
Example in IL:
LD      0.5
COS
ST      q       (*Result is 0.877583*)
```

— **TAN:**
Returns the tangent of number. The value is calculated in arch minutes.

```
Example in IL:
LD      0.5
TAN
ST      q       (*Result is 0.546302*)
```

— **ASIN:**
Returns the arc sine (inverse function of sine) of a number.

```
Example in IL:
LD      0.5
ASIN
ST      q       (*Result is 0.523599*)
```

— **ACOS:**
Returns the arc cosine (inverse function of cosine) of a number. The value is calculated in arch minutes.

```
Example in IL:
LD      0.5
ASIN
ST      q       (*Result is 1.0472*)
```

— **ATAN:**
Returns the arc tangent (inverse function of tangent) of a number. The value is calculated in arch minutes.

```
Example in IL:
LD      0.5
ATAN
ST      q       (*Result is 0.463648*)
```

— **EXPT:**
Exponentiation of a variable with another variable:

Example in IL:

```
LD      7
EXPT    2
ST      var1    (*Result is 49*)
```

4.1.4 Standard Library Elements

String functions

- **LEN:**
  Returns the length of a string. Input STR is a type STRING, the return value of the function is type INT.

  Example in IL:
  ```
  LD      'SUSI'
  LEN
  ST      VarINT1      (*Result is 4*)
  ```

- **LEFT:**
  Left returns the left, initial string for a given string. Input STR is type STRING, SIZE is of type INT, the return value of the function is type STRING.

  Example in IL:
  ```
  LD      'SUSI'
  LEFT    3
  ST      VarSTRING1   (*Result is 'SUS'*)
  ```

- **RIGHT:**
  Right returns the right, initial string for a given string. Input STR is type STRING, SIZE is of type INT, the return value of the function is type STRING.

  Example in IL:
  ```
  LD      'SUSI'
  LEFT    3
  ST      VarSTRING1   (*Result is 'USI'*)
  ```

- **MID:**
  Mid returns a partial string from within a string.

  Example in IL:
  ```
  LD      'SUSI'
  RIGHT   2,2
  ST      VarSTRING1   (*Result is 'US'*)
  ```

- **CONCAT:**
  Concatenation (combination) of two strings.

  Example in IL:
  ```
  LD      'SUSI'
  CONCAT  'WILLI'
  ST      VarSTRING1   (*Result is 'SUSIWILLI'*)
  ```

- **INSERT:**
  INSERT inserts a string into another string at a defined point.

  Example in IL:
  ```
  LD      'SUSI'
  CONCAT  'XY',2
  ST      VarSTRING1   (*Result is 'SUXYSI'*)
  ```

- **DELETE:**
  DELETE removes a partial string from a larger string at a defined position.

  Example in IL:
  ```
  LD      'SUXYSI'
  DELETE  2,23
  ST      Var1    (*Result is 'SUSI'*)
  ```

— **REPLACE:**
REPLACE replaces a partial string from a larger string with a third string.

Example in IL:
```
LD        'SUXYSI'
REPLACE   'K',2,2
ST        VarSTRING1    (*Result is 'SKYSI'*)
```

— **FIND:**
FIND searches for a partial string within a string.

Example in IL:
```
LD        'SUXYSI'
FIND      'XY'
ST        VarINT1       (*Result is '3'*)
```

Bistable Function Blocks

— **SR:**
Making Bistable Function Blocks dominant:
Q1=SR(SET1, RESET) means:
Q1=(NOT RESET AND Q1) OR SET1

Example in IL:
```
CAL       SRInst(SET1:=VarBOOL1, RESET:=VarBOOL2)
LD        SRInst.Q1
ST        VarBOOL3
```

— **RS:**
Resetting Bistable Function Blocks
Q1=SR(SET1, RESET1) means:
Q1=NOT RESET1 AND (Q1 OR SET)

Example in IL:
```
CAL       RSInst(SET:=VarBOOL1, RESET1:=VarBOOL2)
LD        RSInst.Q1
ST        VarBOOL3
```

— **SEMA:**
A Software Semaphore (Interruptible)

Example in IL:
```
CAL       SEMAInst(CLAIM:=VarBOOL1, RELEASE:=VarBOOL2)
LD        SEMAInst.BUSY
ST        VarBOOL3
```

Trigger

— **R_TRIG:**
The function block R_TRIG detects a rising edge.

Example in IL:
```
CAL       RTRIGInst(CLK:=VarBOOL1)
LD        RTRIGInst.Q
ST        VarBOOL2
```

— **F_TRIG:**
The function block F_TRIG detects a falling edge.

Example in IL:
```
CAL       FTRIGInst(CLK:=VarBOOL1)
LD        FTRIGInst.Q
ST        VarBOOL2
```

Counter

— **CTU:**
The function block Incrementer.

Example in IL:
```
CAL     CTUInst(CU:=VarBOOL1,RESET:=VarBOOL2,PV:=Var
        INT1)
LD      CTUInst.Q
ST      VarBOOL3
LD      CTUInst.CV
ST      VarINT2
```

— **CTD:**
The function block Decrementer.

Example in IL:
```
CAL     CTDInst(CD:=VarBOOL1,LOAD:=VarBOOL2,PV:=Var
        INT1)
LD      CTDInst.Q
ST      VarBOOL3
LD      CTDInst.CV
ST      VarINT2
```

— **CTUD:**
The function block Incrementer/Decrementer.

Example in IL:
```
CAL     CTUDInst(CU:=VarBOOL2,RESET:=VarBOOL3,LOAD:=
        VarBOOL4,PV:=VarINT1)
LD      CTUDInst.QU
ST      VarBOOL5
LD      CTUDInst.QD
ST      VarBOOL6
LD      CTUDInst.CV
ST      VarINT2
```

Timer

— **TP:**
The function block Timer is a trigger.

Example in IL:
```
CAL     TPInst(IN:=VarBOOL1,PT:=T#5s)
LD      TPInst.Q
ST      VarBOOL2
```

— **TON:**
The function block Timer On Delay implements a turn-on delay.

Example in IL:
```
CAL     TONInst(IN:=VarBOOL1,PT:=T#5s)
LD      TONInst.Q
ST      VarBOOL2
```

— **TOF:**
The function block TOF implements a turn-off delay.

Example in IL:
```
CAL     TOFInst(IN:=VarBOOL1,PT:=T#5s)
LD      TOFInst.Q
ST      VarBOOL2
```

— **RTC:**
The function block Runtime Clock returns, starting at a given time, the current date and time.

4.1.5 Operands

Overview

Constants, variables, addresses and possibly function calls can appear as operands.

Constants

- **BOOL:**
  BOOL constants are the logical values TRUE and FALSE.
- **TIME:**
  TIME constants can be declared in SIJECT Project Tool. These are generally used to operate the timer in the standard library. A TIME constant is always made up of an initial “t” or “T” and a number sign “#”.

  Example:
  TIME1:=T#14ms
- **DATE:**
  These constants can be used to enter dates. A DATE constant is declared beginning with a “d”, “D”, “DATE” or “date” followed by “#”. You can then enter any date with format Year-Month_Day.

  Example:
  DATE#1996-05-06
- **TIME_OF_DAY:**
  Use this type of constant to store times of the day.

  Example:
  TIME_OF_DAY#15:36:30.123
- **DATE_AND_TIME:**
  Date constants and the time of day can also be combined to form so-called DATE_AND_TIME CONSTANTS.

  Example:
  DATE_AND_TIME#1996-05-06-15:36:30
- **Number:**
  Number values can appear as binary numbers, octal numbers, decimal numbers and hexadecimal numbers.

  Example:
  14 (Decimal number)
- **REAL/LREAL:**
  REAL and LREAL constants can be given as decimal fractions and represented exponentially.

  Example:
  7.4 instead of 7,4
- **STRING:**
  A string is a sequence of characters. STRING constants are preceded and followed by single quotation marks. You may also enter blank spaces and special characters. They will be treated just like all other characters.

  Example:
  ‘Abby and Craig’

Variables

Variables can be declared either locally in the declaration part of a POU or in a global variable list.

— **System Flags:**
System flags are implicitly declared variables that are different on each specific PLC. To find out which system flags are available in your system, use the command “**Insert**” “**Operand**”. An Input Assistant dialog box pops up, select the category **System Variable**.

— **Accessing variables for arrays, structures and POUs:**
Two-dimensional array components can be accessed using the following syntax:
<Fieldname>[Index1, Index2]

Structure variables can be accessed using the following syntax:
<Structurename>.<Variablenname>

Function block and program variables can be accessed using the following syntax:
<Functionblockname>.<Variablenname>

Addresses

— **Address:**
The direct display of individual memory locations is done through the use of special character sequences. These sequences are a concatenation of the percent sign “%”, a range prefix, a prefix for the size and one or more natural numbers separated by blank spaces.

Example:
%QX75 and %Q75 Output bit 75

— **Memory location:**
You can use any supported size to access the memory location.

Functions

In ST a function call can also appear as an operand.

Example:
Result:=Fct(7)+3;

4.2 SIMATIC Manager

Introduction

STEP7 is the basic programming and configuration software for SIMATIC. It is made up of a series of applications, each of which does a specific job within the scope of programming an automation task, such as:

- configuring and assigning parameters to the hardware
- creating and debugging user programs
- configuring networks and connections

The basic package can be extended by a range of optional packages, for example, additional programming language packages such as SCL, S& Graph, or HiGraph.

The graphic user interface provided for these tasks is known as the SIMATIC Manager. The SIMATIC Manager collects all the data and the settings necessary for an automation task together in a project. Within this project the data are structured according to their function and represented objects.

Note

To operate the **SIMATIC Manager,** please order the software and program according to the Operation Manual.

---

5 Technical appendix

Contents

Section	Heading	Page
5.1	Definition of DB1	5-2
5.2	Glossary abbreviation	5-8

5.1 Definition of DB1

DB1 Definition

Address	Type	Description
	DB1.keys8_15	
DB1.DBX0.0	Key 8	Cycle stop
DB1.DBX0.1	Key 9	Heater start
DB1.DBX0.2	Key10	Heater stop
DB1.DBX0.3	Key11	Mold open
DB1.DBX0.4	Key12	Mold close
DB1.DBX0.5	Key13	Ejector retract
DB1.DBX0.6	Key14	Ejector advance
DB1.DBX0.7	Key15	Carriage advance
	DB1.keys0_7	
DB1.DBX1.0	Key 0	Semi-auto mode
DB1.DBX1.1	Key 1	Photo-sensor full-auto mode
DB1.DBX1.2	Key 2	Timer full-auto mode
DB1.DBX1.3	Key 3	Cycle run
DB1.DBX1.4	Key 4	Manual mode
DB1.DBX1.5	Key 5	Mold adjustment mode
DB1.DBX1.6	Key 6	Motor start
DB1.DBX1.7	Key 7	Motor stop
	DB1.keys24_31	
DB1.DBX2.0	Key24	Air blow 1
DB1.DBX2.1	Key25	Air blow 2
DB1.DBX2.2	Key26	Mold adjustment retract
DB1.DBX2.3	Key27	Mold adjustment advance
DB1.DBX2.4	Key28	Lubrication
DB1.DBX2.5	Key29	Purge (start)
DB1.DBX2.6	Key30	Purge (stop)
DB1.DBX2.7	Key31	ACK
	DB1.keys16_23	
DB1.DBX3.0	Key16	Carriage retract
DB1.DBX3.1	Key17	Injection
DB1.DBX3.2	Key18	Decompression
DB1.DBX3.3	Key19	Charge
DB1.DBX3.4	Key20	Core 1 in
DB1.DBX3.5	Key21	Core 1 out
DB1.DBX3.6	Key22	Core 2 in
DB1.DBX3.7	Key23	Core 2 out
	DB1.keys_ spare	
DB1.DBX4.0	Key32	Core 3 in

Address	Type	Description
DB1.DBX4.1	Key33	Core 3 out
DB1.DBX4.2	Key34	Auto mold adjustment start
DB1.DBX4.3	Key35	Auto mold adjustment stop
DB1.DBX4.4	Key36	Product reset
DB1.DBX4.5	Key37	Injection reset
DB1.DBX4.6	Key38	Confirm update time
DB1.DBX4.7	Key39	Force output
DB1.DBB5	Type of value	0: recipe byte 1: recipe word 2: actual value
DB1.DBB6	DB1.dummy1	Data from OP to PLC
DB1.DBB7	DB1.val_index	
DB1.DBW8	DB1.op_value	
DB1.DBB10	DB1.op_spare1	
DB1.DBB11	DB1.read_or_write	
DB1.DBB12	DB1.op_comm	Semaphore "OP_COMM" FF = data from OP are in DBW0—DBW10 00 = PLC has read the data and stored in DBW20--DBW24
DB1.DBB13	DB1.dummy2	Spare
DB1.DBW14	DB1.dummy3	Spare
DB1.DBW16	DB1.dummy4	Spare
DB1.DBW18	DB1.dummy5	Spare
DB1.DBB20	DB1.leds_spare	Spare for LED
	DB1.leds0_7	
DB1.DBX21.0	LED0	Motor start
DB1.DBX21.1	LED1	Mold adjustment mode
DB1.DBX21.2	LED2	Manual mode
DB1.DBX21.3	LED3	Cycle run
DB1.DBX21.4	LED4	Photo-sensor full-auto mode
DB1.DBX21.5	LED5	Timer full-auto mode
DB1.DBX21.6	LED6	Semi-auto mode
DB1.DBX21.7	LED7	Heater start
DB1.DBW22	DB1.plc_value	Data from PLC to OP
DB1.DBW24	DB1.plc_spare	
DB1.DBW26	DB1.dummy6	Spare
DB1.DBB28	DB1.select_thermo	00 = type "J" thermocouple FF = type "K" thermocouple
DB1.DBB29	DB1.select_alarm	00 = no process alarm FF = have process alarm
DB1.DBW30	DB1.life_ctr	Life counter (incremented by PLC program)
DB1.DBB32	DB1.finish_start	00 = PLC start up not finished and ready FF = PLC start up finished and ready

Address	Type	Description
DB1.DBB33	DB1.screw_pulses	Screw pulses/round
DB1.DBB34	DB1.version_yy	PLC version-number YY
DB1.DBB35	DB1.version_xx	PLC version-number XX
DB1.DBB36	DB1.dummy8	Spare
DB1.DBW37	DB1.flags1	Bit0:Machine ready (0: ready 1: running); Bit1:OP selection (0:OP15 1:Simatic OP); Bit2:PV selection (0:OP15 1:Simatic OP);
DB1.DBW38	DB1.Shot_counter	Shot counter actual value
	DB1.do_trans8_15	
DB1.DBX40.0	M40_0	Mold close valve
DB1.DBX40.1	M40_1	Mold close fast valve
DB1.DBX40.2	M40_2	Mold open valve
DB1.DBX40.3	M40_3	Mold open fast valve
DB1.DBX40.4	M40_4	Mold adjustment advance valve
DB1.DBX40.5	M40_5	Mold adjustment retract valve
DB1.DBX40.6	M40_6	Ejector advance valve
DB1.DBX40.7	M40_7	Ejector retract valve
	DB1.do_trans0_7	
DB1.DBX41.0	M41_0	Core 1 in valve
DB1.DBX41.1	M41_1	Core 1 out valve
DB1.DBX41.2	M41_2	Core 2 in valve
DB1.DBX41.3	M41_3	Core 2 out valve
DB1.DBX41.4	M41_4	Carriage advance valve
DB1.DBX41.5	M41_5	Carriage retract valve
DB1.DBX41.6	M41_6	Charge valve
DB1.DBX41.7	M41_7	Injection valve
	DB1.do_relais0_7	
DB1.DBX42.0	M42_0	Heater output 1
DB1.DBX42.1	M42_1	Heater output 2
DB1.DBX42.2	M42_2	Heater output 3
DB1.DBX42.3	M42_3	Heater output 4
DB1.DBX42.4	M42_4	Heater output 5
DB1.DBX42.5	M42_5	Heater output 6
DB1.DBX42.6	M42_6	Heater output 7
DB1.DBX42.7	M42_7	Heater output 8
	DB1.do_trans16_23	
DB1.DBX43.0	M43_0	Decompression valve
DB1.DBX43.1	Q_Pump_2	Pump 2
DB1.DBX43.2	M44_7	Zero back pressure valve
DB1.DBX43.3	M43_3	Robot
DB1.DBX43.4	M43_4	Core 3 in valve
DB1.DBX43.5	M43_5	Core 3 out valve

Address	Type	Description
DB1.DBX43.6	M44_4	Air blow 1
DB1.DBX43.7	M44_6	Air blow 2
	DB1.do_relais8_15	
DB1.DBX44.0	M44_0	Motor star start
DB1.DBX44.1	M44_1	Motor triangle start
DB1.DBX44.2	M44_6	Motor start
DB1.DBX44.3	M44_2	Alarm LED
DB1.DBX44.4	M43_2	Lubrication output
DB1.DBX44.5	M44_3	Alarm buzzer
DB1.DBX44.6		
DB1.DBX44.7		
	DB1.uni_bi_polar	
DB1.DBX45.0	Analog output 0 type	0 = unipolar (0-10V), 1 = bipolar(-10V-10V)
DB1.DBX45.1	Analog output 0 type	0 = unipolar (0-10V), 1 = bipolar(-10V-10V)
DB1.DBX45.2	Analog output 0 type	0 = unipolar (0-10V), 1 = bipolar(-10V-10V)
DB1.DBX45.3	Analog output 0 type	0 = unipolar (0-10V), 1 = bipolar(-10V-10V)
DB1.DBX45.4	Spare	
DB1.DBX45.5	Spare	
DB1.DBX45.6	Spare	
DB1.DBX45.7	Spare	
DB1.DBW46	DB1.a_out_0	Analog output 0: pressure (0-100%)
DB1.DBW48	DB1.a_out_1	Analog output 1: flow (0-100%)
DB1.DBW50	DB1.a_out_2	Analog output 2: back pressure (0-100%)
DB1.DBW52	DB1.a_out_3	Analog output 3: spare (0-100%)
DB1.DBW54	DB1.dummy10	Spare
DB1.DBW56	DB1.dummy11	Spare
DB1.DBB58	DB1.dummy12	Spare
DB1.DBX59.0	DB1.f_indicate	0 = OK 1 = power supply for linear scale failure
DB1.DBX59.1	DB1.?	1 = battery alarm
DB1.DBX59.2	Spare	
DB1.DBX59.3	Spare	
DB1.DBX59.4	Spare	
DB1.DBX59.5	Spare	
DB1.DBX59.6	Spare	
DB1.DBX59.7	Spare	
	DB1.d_in8_15	
DB1.DBX60.0	Input 8	Safety door 2
DB1.DBX60.1	Input 9	Back door
DB1.DBX60.2	Input10	
DB1.DBX60.3	Input11	Carriage advance end

Address	Type	Description
DB1.DBX60.4	Input12	Carriage retract end
DB1.DBX60.5	Input13	Ejector advance end
DB1.DBX60.6	Input14	Ejector retract end
DB1.DBX60.7	Input15	Mold close end
	DB1.d_in0_7	
DB1.DBX61.0	Input 0	
DB1.DBX61.1	Input 1	
DB1.DBX61.2	Input 2	
DB1.DBX61.3	Input 3	
DB1.DBX61.4	Input 4	
DB1.DBX61.5	Input 5	
DB1.DBX61.6	Input 6	
DB1.DBX61.7	Input 7	
	DB1.d_in24_31	
DB1.DBX62.0	Input24	Safety door 1
DB1.DBX62.1	Input25	Lubrication error
DB1.DBX62.2	Input26	Mold adjustment photo-sensor
DB1.DBX62.3	Input27	Full-auto photo-sensor
DB1.DBX62.4	Input28	Robot
DB1.DBX62.5	Input29	Core 3 in end / counter sensor
DB1.DBX62.6	Input30	Core 3 out end
DB1.DBX62.7	Input31	Screw speed sensor
	DB1.d_in16_23	
DB1.DBX63.0	Input16	Mold adjustment advance end
DB1.DBX63.1	Input17	Mold adjustment retract end
DB1.DBX63.2	Input18	Core 1 in end / counter sensor
DB1.DBX63.3	Input19	Core 1 out end
DB1.DBX63.4	Input20	Core 2 in end / counter sensor
DB1.DBX63.5	Input21	Core 2 out end
DB1.DBX63.6	Input22	Injection safety door
DB1.DBX63.7	Input23	Motor overload
DB1.DBW64	DB1.screw_speed	Screw speed actual value
	DB1.thermo: ARRAY[0..7] of word	
DB1.DBW66	DB1.thermo[0]	Analog input TC: 0 (nozzle)
DB1.DBW68	DB1.thermo[1]	Analog input TC: 1
DB1.DBW70	DB1.thermo[2]	Analog input TC: 2
DB1.DBW72	DB1.thermo[3]	Analog input TC: 3
DB1.DBW74	DB1.thermo[4]	Analog input TC: 4
DB1.DBW76	DB1.thermo[5]	Analog input TC: 5
DB1.DBW78	DB1.thermo[6]	Analog input TC: 6
DB1.DBW80	DB1.thermo[7]	Analog input TC: 7 (oil)

Address	Type	Description
DB1.DBW82	DB1.dummy13	Spare
DB1.DBW84	DB1.lin_scale0	Analog input linear scale 0 (0-10V): mold
DB1.DBW86	DB1.lin_scale1	Analog input linear scale 1 (0-10V): injection
DB1.DBW88	DB1.lin_scale2	Analog input linear scale 2 (0-10V): ejector
DB1.DBW90	DB1.lin_scale3	Analog input linear scale 3 (0-10V): carriage
DB1.DBB92	DB1.mem_comm	Semaphore "MEM_COMM" 0 = finished 1 = put recipe into DB2 2 = get recipe from DB2
DB1.DBB93	DB1.recipe_nr	Recipe-number
DB1.DBW94	DB1.recipe_len	Length of recipe (unit: byte)
DB1.DBW96	DB1.recipe_data ARRAY[0..1023] of byte	The starting address for recipe DB1.DBB96—DB1.DBB1119
	DB1.comm_errors ARRAY[0..15] of word	DB1.DBW1120—DB1.DBW1150
	DB1.io_errors	DB1.DBW1152
	DB1.perf_errors	DB1.DBW1154
	DB1.can_errors ARRAY[0..15] of word	DB1.DBW1156—DB1.DBW1186

5.2 Glossary abbreviation

AC	Alternating current
AI	Analog input
AO	Analog output
ADC	Analog-digital conversion
BATF	Battery fault
CORA	Coupling RAM Arbiter
CI	Compact interface
CPU	Central processing unit
CAN BUS	Controller Area Network BUS
CSP	Customer specific picture
DAC	Digital –analog conversion
DC	Direct current
DI	Digital input
DO	Digital output
DPSF	CPU 315DP system fault
DPSTAT	CPU 315DP system status
DRAM	Dynamic RAM
FRCE	Force
HW	Hardware
LCD	Liquid crystal display
LED	Low Emitting Diode
LS	Linear scale
MMC	Multi-media card
MPI	Multi-port input
MRES	Reset memory
OP	Operator panel
PC/PG	Programming device
PV	Proportion valve
PROFIBUS	PROFI-Bus
PBUS	Periphery-Bus
PLC	Program logic controller
RECIPE	Recipe
RUN－P	Program run
SRAM	Static RAM
SF	System fault
SW	Software
TC	Temperature control

To **SIEMENS NUMERIC CONTROL LTD., NANJING, CHINA** **R&D Division** **No.18, Siemens Road, Jiangning Development Zone** **211100 Nanjing** **People Republic of China**	Suggestions Corrections For Publication/Manual: SIJECT 15/16 Start-up Software Version 1 Manufacturer Documentation
From Name	Technical Manual Order No.: 6AT1931-5AB61-0KA1 Edition: 06.2003
Company/Dept. Address _____ Telephone: _____ Fax: _____	Should you come across any printing errors when reading this publication, please notify us on this sheet. Suggestions for improvement are also welcome.

Suggestions and/or corrections: